...; FEBRUARY 18, 1937.

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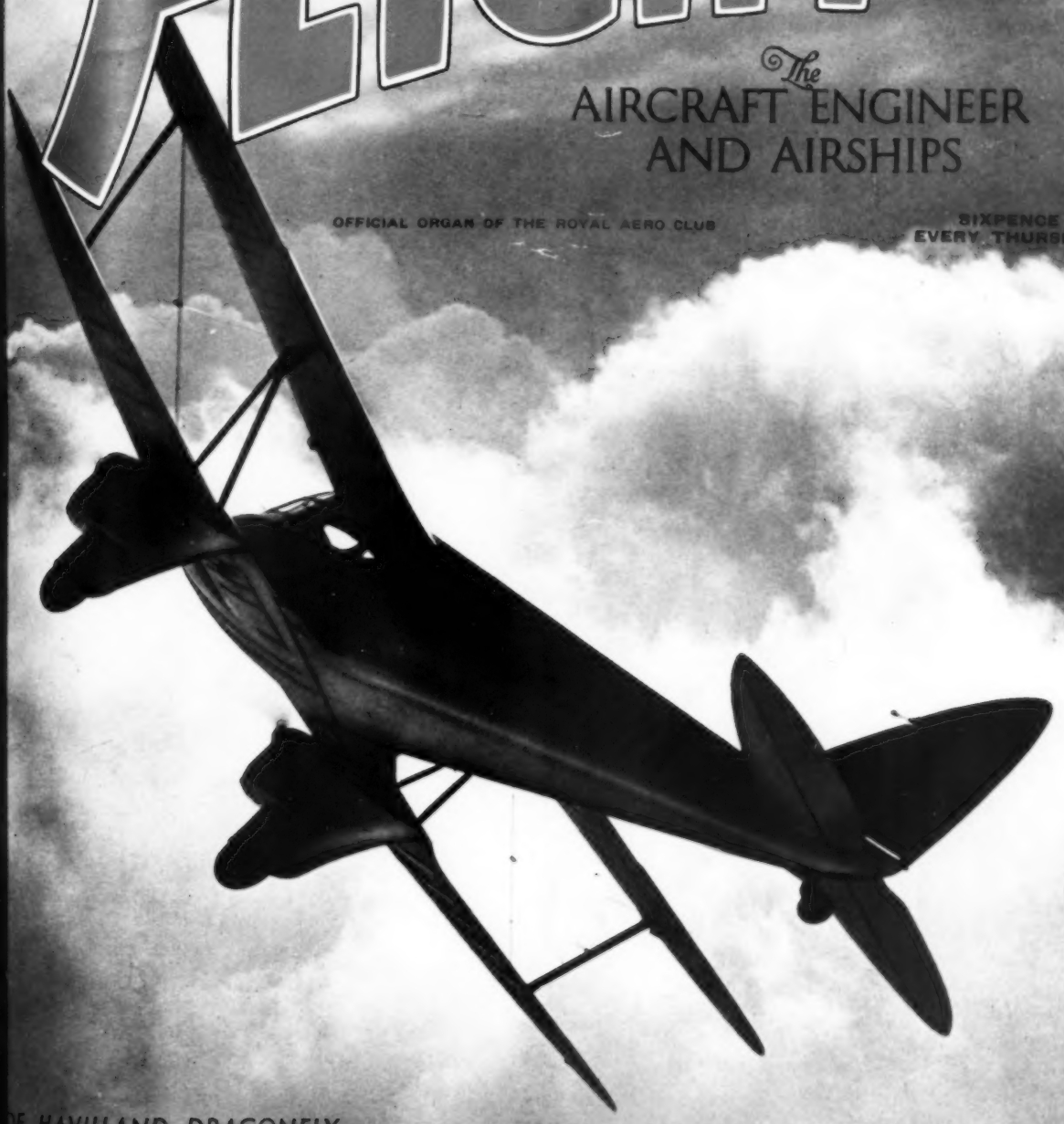

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The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Oxford and Air Defence

IT does not often happen that a heavily taxed electorate, much concerned about questions of air defence, takes an intimate interest in the election of a University Member of Parliament. At present the election to fill the vacancy caused by the appointment of Lord Hugh Cecil (himself an ex-officer of the R.A.F.) as Provost of Eton, has become a matter of general interest, while to the aeronautical community it has assumed a special interest. The election is quite outside ordinary party politics, as two of the candidates are Conservatives, and one (Sir Arthur Salter) stands as an Independent.

Professor F. A. Lindemann, in his election address, makes an appeal to *arma* rather than to *toga*. He hopes to represent science in the House of Commons, where indeed it is all too scantily represented, and that is certainly fitting in a University Member—though Cantabs may express pained surprise that Oxford should claim to have any truck with such an unclassical subject. But to Professor Lindemann science does not mean only the laboratory and midnight oil. He is determined to apply his science to air defence, and to use his influence, if elected, in building up a powerful Air Force. It was a monk, Roger Bacon, who invented gunpowder, and Professor Lindemann evidently intends to follow in his train.

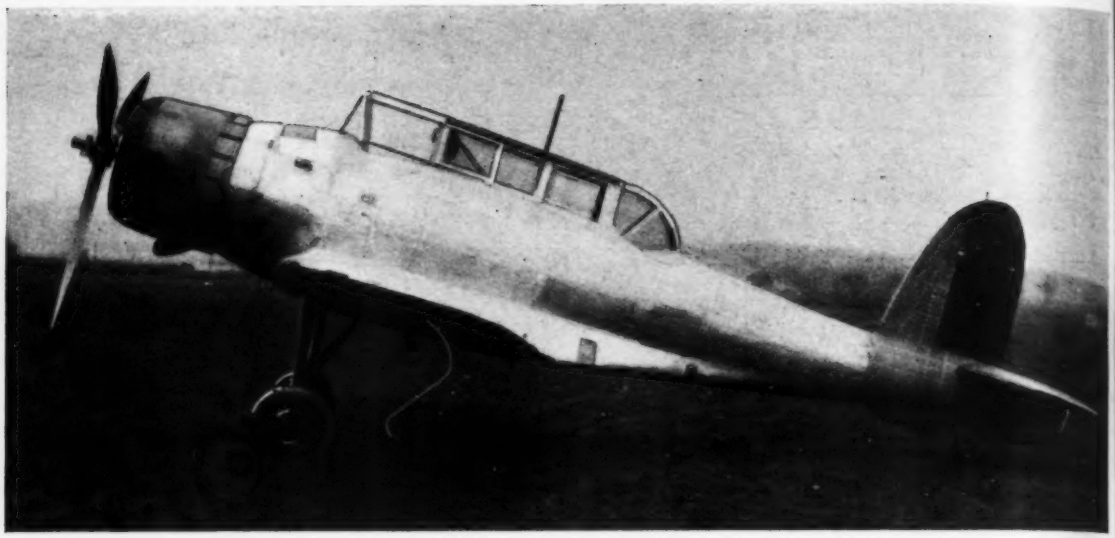
Coming from such a source, the election address of Professor Lindemann is a tonic in these pessimistic days. Mr. Baldwin once was so injudicious as to remark "the bomber will always get through." Professor Lindemann quotes the remark and will have none of it. Quite recently Mr. Churchill expressed the belief that some day, but not in the near future, air defence would get the better of air attack. Such remarks from Mr. Churchill are not always taken very seriously. But when we find Professor Lindemann saying much the same thing we cannot pass it over lightly. He has long maintained, he says, that it should be possible to defend our coast-line and to prevent hostile aeroplanes from reaching and wrecking our cities. Science, he hopes, will provide the solution of what is perhaps the greatest danger which has ever confronted Great Britain. But before the bomber is rendered innocuous, this Oxford Don would see Britain armed with overwhelming air power.

Such sentiments and such beliefs would surely do the House of Commons a great deal of good. In the debates there is far too much amateurish and ill-informed talk about air defence and air power. A knowledge of strategy, tactics, and science are all needed when discussing such a very specialised subject, and the more Members who are able to speak on it with sense and knowledge the better. No good is done by parrot-like repetitions of phrases uttered by non-expert Prime Ministers or non-expert popular newspapers. The subject should be debated by people who have an understanding of it.

Only one possible objection to Professor Lindemann's entry into Parliament occurs to the mind, and that is the difficulty of carrying on parliamentary work and scientific research at the same time.

Untaught Teachers

AS a contrast to the robust opinions of Professor Lindemann, some two hundred persons engaged in responsible educational work have drawn up a petition to be presented to the Prime Minister, asking him to prepare a scheme for the "total abolition of all military and naval aircraft." Of course, there is no harm in asking for the moon, but one is certainly surprised to see such personages as the Principals of Aberdeen University and the University College of North Wales, the Provost of Oriel College, Oxford, and Professor Gilbert Murray stating their belief that such a thing is possible, and wasting the time of the Prime Minister by asking him to try to bring it about. If they had asked him to arrange for the abolition of all pugnacious instincts in mankind it would have been far more sensible and no more impracticable. Scientists like Professor Lindemann may be able to abolish the menace of air raids on Britain or on any other country, but Mr.



FOR DIVERS DUTIES : A versatile new Blackburn aeroplane ordered in quantity for the Fleet Air Arm : the fleet-fighter dive-bomber monoplane with 825/840 h.p. Bristol Mercury engine. The arrangement of the tail unit is perhaps the most striking feature of this noteworthy machine, which is seen here in a not-quite-finished state.

Baldwin can no more contrive the abolition of warlike aircraft than of rifles and bayonets.

What these well-meaning but ignorant instructors of youth fail to grasp is that so long as war is a possibility, so long is it out of the question to try to deprive the fighting men of any legitimate means of defeating the armed forces of the enemy. It is possible, by international agreement, to forbid them to misuse their weapons by striking at civil populations. There have always been rules of war, and such rules there always must be. Unthinking people have said that in the last war all rules were broken, but that is not true. We may instance the facts that dum-dum bullets were not used, that water supplies were not infected with bacteria, and that gas bombs were not dropped on cities.

All the principal nations have, in fact, signed an agreement to refrain from gas warfare and chemical warfare, and those to whom a signed word is but a scrap of paper are likely to be restrained from a breach of the rules of war by the fear of reprisals and of antagonising neutral opinion. But the air bomber, used in its proper way as a long-range gun, is a perfectly legitimate weapon of war. Air Chief Marshal Sir John Steel, when he commanded the Wessex Bombing Area, once said during some air exercises, "I have given my pilots military objectives, which the guns would shell if they could reach them." That is the correct doctrine of bombing.

As for fighter aircraft, they are defensive weapons pure and simple. If the fighters were abolished, then every civil aeroplane in the hands of unscrupulous belligerents would become a potential bomber ; but converted airliners would fall very easy victims to first-class fighters. Educational authorities as a rule have very hazy ideas of the difference between a bomber and a fighter, and they seem to think that the only function of a bomber is baby-killing. If that view were correct, it might perhaps be possible to abolish the bomber ; but to abolish long-range artillery is as impossible as to abolish war.

We may see hope for the future in Professor Lindemann and his science, but none in the ideas of these two hundred educationists. That people with such uninstructed minds should be in charge of the teaching of the young—there is the tragedy which all must deplore.

NAUTICAL NEOPHYTE : The first monoplane to be ordered for F.A.A. equipment, the new Blackburn incorporates such modern aids to performance as flaps, D.H. v.p. airscrew and retractable undercarriage. The engine in the prototype is an 825/840 h.p. Bristol Mercury which may be replaced by a sleeve-valve Perseus. **Another view appears on page 165.**

The Outlook

A Running Commentary on Air Topics

"The Halfpenny be Demmed"

DEVOTEES of the immortal Charles Dickens will recognise the above quotation. It may never have occurred to them that this phrase should be the motto of a number of commercial aircraft enterprises in foreign countries which are backed by their respective Governments. Yet that conclusion may be drawn from the address given last week by Col. Burchall to the Institute of Journalists. His text was that national air services have become a symbol of national prestige, and that Government grants encourage the running of many lines which do not pay for themselves and show no prospect of paying for themselves in the near future. He mentioned the insignificant loads with which France runs to South America, said that the vast network of German air services in Europe was not for trade purposes, as that country is following the policy of self-sufficiency, questioned the commercial prospects of Holland's schemes for services to Manila, Australia, and South Africa, and quoted the United States Federal Aviation Commission which prophesied in 1935 that "financial disaster is in the making for a large part of the present air transport system. . . We cannot see how it can be postponed indefinitely."

Germany spent in 1934-5 ten million pounds on her civil air transport, the United States last year spent five million, France over one and a half million, Italy £795,000, while the United Kingdom confined itself to a modest £639,000. We may not have achieved such wonders as the United States has admittedly accomplished, but it certainly seems that our air transport is in a healthier state than that of some other countries.

The Singapore Manœuvres

CORRESPONDENTS who watched the recent large-scale manœuvres at Singapore have written home to say that the defences were thoroughly tested and were proved impregnable. We take leave to doubt whether any sham fights can prove any position to be impregnable, but, all the same, it is comforting to believe that Singapore is very strong. One notable incident was the apparent ease with which the shore-based aircraft dealt with the aircraft-carrier *Hermes*. When she came into range, the reconnoitring flying boats sent wireless messages to the garrison, and the bombers made a surprise attack and riddled her flying deck with imaginary bombs. That is what many experts tell us will be the normal procedure whenever a fleet is engaged, either with a shore fortress or with another fleet. The carriers on the other side will be the first target of the striking air force. They should be the easiest target, and, so long as it is not found possible to armour-plate the flying deck, dive bombers should be able to make flying off and flying on quite impossible. Capital ships can and will have their decks so heavily armoured that dive bombing by light bombers will do the ships no considerable harm. But will the Admiralty be able to armour-plate the decks of future carriers?

Naval men, who regard the gun as a far more accurate and deadly weapon than the bomb, look on spotting as the chief service which aircraft can render in a fleet action, as that increases the effective range of the gun. From that point of view the coming of the aeroplane does not diminish the Navy's power, but increases it. Gunnery officers prefer that the spotting should be done by an observer from their own ship, and therefore set more store by their own catapult seaplanes than by the carrier-borne aircraft.

Flying Boats and the Fleet

THE four London flying boats of No. 201 (F.B.) Squadron had to return from their cruise in the Mediterranean without taking part in exercises with the fleet because the weather was too bad. This was distinctly unfortunate, as it is very desirable that data should be accumulated about the degree of use which that type of aircraft can be to a fleet at sea. It is evident that large flying boats must have either a land base or a mother ship from which to refuel, and if they are to go with the fleet for any considerable distance the latter would seem a necessity. Even so, refuelling in a heavy sea can never be an easy operation. But if bad weather forbids the boats to take any part in the fleet's exercises there would seem small reason for naval officers to claim, as some have done, that the Navy ought to have flying boats of its own. Presumably the Admiralty has never asked for any, apart from the small catapult machine, the Walrus, for if it had done so the request would surely not have been refused by the Air Ministry, especially as the Admiralty pays for the whole of the Fleet Air Arm and would likewise without doubt have paid for any flying boats which it ordered.

The indications are that for warlike operations in Home waters the flying boat, which may yet grow to a size only faintly foreshadowed by the Short Empire class, will remain invaluable for really long reconnaissance, while in the Overseas Commands its uses will remain varied and important. More cannot be said at present with any certainty.

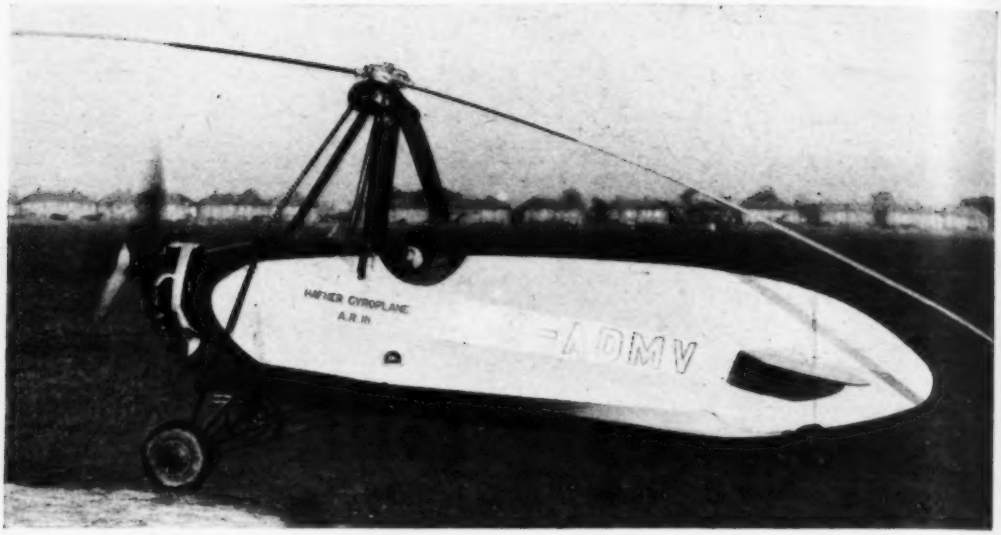
Air Cooling's Future

"DURING the next five years it would appear that the smaller the size of the aircraft the more difficult will it be to obtain a suitably scaled radial or in-line engine of sufficient power, whereas the larger the size of the aircraft the less, it seems, can be said against the radial. In fact, in the largest category the engine is almost entirely lost in the section of the wing." This is but one of several aspects of the air-cooled engine problem which Mr. Roy Fedden will discuss in his lecture to the Royal Aeronautical Society to-night. His view is that in the matter of engine arrangements the present fashion of engines abreast along the leading edge of the wings will continue to be in vogue, the number of engines being four, six or even eight, according to the size of the aircraft.

It seems possible that during the discussion some of the aircraft designers may join issue with Mr. Fedden on the spreading-out of eight engines abreast, four in each wing-half, although it is obvious that a machine which required this number of engines would be a very large one, so that the turning moment with one outer engine stopped would, presumably, be met by a correspondingly long fuselage if the present ratio of span to length is maintained.

It is interesting to discover that Mr. Fedden expects to be able to meet new aircraft demands with four sizes of engine, a 750 h.p. unit weighing 820 lb., a 1,150 h.p. weighing 1,250 lb., a 1,550 h.p. weighing 1,550 lb., and a 2,000 h.p. weighing 2,100 lb. An interesting point here is that the 1,550 h.p. engine appears as the most economic size, its weight being exactly one pound per horse power. In smaller sizes, and again in larger, the weight goes up.

The fact that Mr. Fedden will also deal with such interesting subjects as engine layouts from the geometric and aerodynamic aspects, and with a comparison of the petrol and the compression-ignition engine on a basis of fuel consumption and cost, suffices to ensure a very interesting and informative meeting.



The Hafner A.R.III, Mark II, has a very short take-off run (about two yards) and climbs remarkably steeply. The engine is a 90 h.p. Pobjoy Niagara III. (*Flight* photograph.)

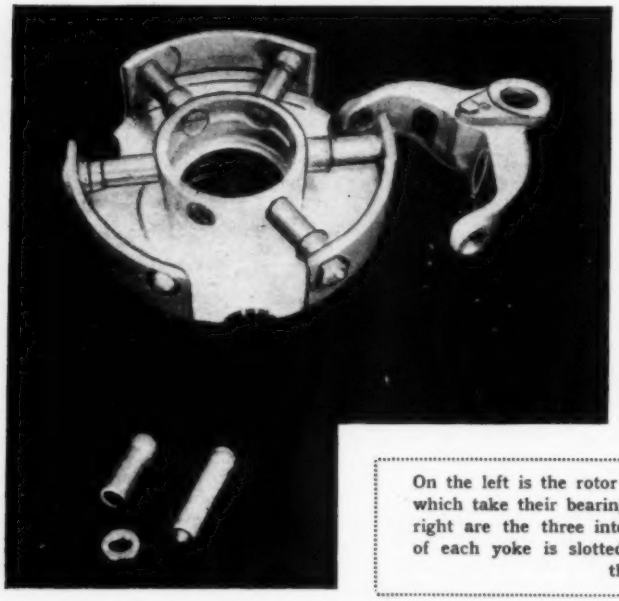
A NEW ROTOR

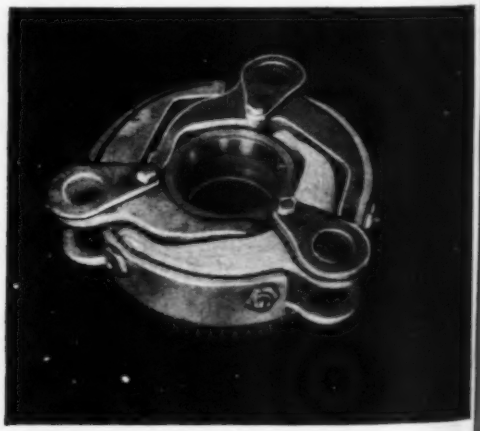
First Details of the Hafner Gyroplane: "Finger-light" Control: Improved Rotor Efficiency

THEORETICALLY it should be possible to suspend the blades of a rotating-wing aircraft on wires, provided that the blades were stable in pitch, and if some means could be found of getting the blades started on their circular path. It is rather the stone-on-a-string problem in a slightly different form, or perhaps one would be nearer the mark in comparing it with the cowboy's "building a loop" in his rope. In the type of rotor head on which he has been working for several years Mr. R. Hafner has made use of this principle, and the very light rotor control of the A.R.III gyroplane is a direct result of suspending the blades on tension members of small diameter which can twist under relatively small torsional loads. In this way friction is greatly reduced and the pilot's controls become as light as those of a fixed-wing aircraft.

The torsionally elastic suspension of the blades is by no means the only interesting feature of the Hafner rotor, but it does form the basis for the rest of the mechanism, which is shown in the sketches which illustrate these notes.

Before describing the mechanical details it may be of assistance if the fundamental principles are explained briefly. The rotor blades are attached to the head in the orthodox manner, with horizontal hinges which permit the blades to "flap," and vertical hinges with friction dampers for permitting the blades that slight freedom to alter their spacing to which one has become accustomed. The actual attachment of the blades to their hinged forks is, however, by way of the "wire" referred to above, so that in addi-





On the left is the rotor hub with one of the three yokes and the hinge bolts which take their bearings on the inner and outer flanges of the hub. On the right are the three interlapping yokes in place on the hub. The larger arm of each yoke is slotted to accommodate the hinge pin of the shorter arm of the adjacent yoke and vice versa.

tion to the freedom provided by the two sets of hinges the blades have a third degree of freedom, i.e., to alter their pitch angle. The last-mentioned freedom is, however restricted or damped, as will be explained later.

The inner end of each blade carries a crank arm on a vertical hinge, the hinge being incorporated in order to leave the blades free to "catch up" or lag behind one another. A so-called "spider" is mounted centrally above the rotor head, and also carries three arms mounted on vertical hinges. The free ends of the blade cranks are connected (by a cup and ball joint) to the free ends of the spider cranks. When the spider is raised, by means of a separate control in the cockpit, its three crank arms rise with it and carry with them the free ends of the blade cranks, thereby increasing the pitch angles of all three blades (the spider rotates with the rotor head, of course), and when the spider is lowered the pitch angles are reduced. This control might be termed the lift control, as it varies the amount of lift given by the blades, and is used for steep take-off and for checking sinking when landing.

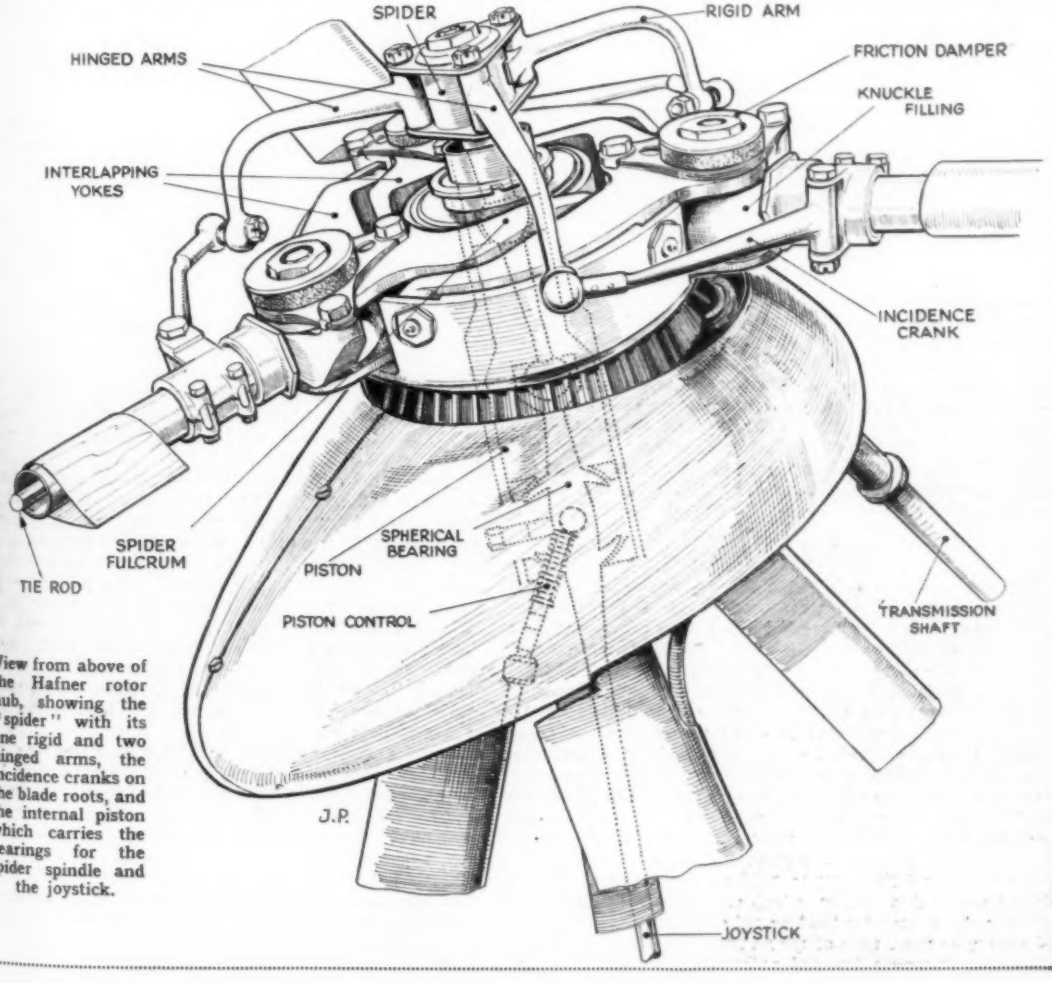
The flying control has the effect of shifting the centre of lift of the whole rotor system by causing the blades to assume an increased pitch angle at one point of their travel around the circle and a decreased pitch angle at other points. This is effected quite simply by tilting the spider. Obviously, if the spider is tilted back the blades will assume a low-pitch angle when passing through their rearmost position and a larger-pitch angle when passing through the foremost position, thus shifting the centre of lift ahead of the rotor pivot and thereby causing the machine to climb. If the spider is tilted to the left the pitch angle will be large on the right-hand side and small on the left-hand side, and the machine will bank and turn to the left.

Flying controls on the A.R.III gyroplane also include a trimming tailplane and a pedal-operated rudder of orthodox type.

Details of the actual mechanical application of the fundamental principles outlined above are illustrated in the sketches. The rotor blades have single steel-tube spars of small diameter but heavy gauge. No attempt has been made at saving weight on the rotor blades; in fact, weight has deliberately been kept fairly high in order to obtain a good flywheel effect to assist take-off and to ease the machine down gently through the last couple of feet of the landing. In this connection it may be pointed out that the mass of the blade per unit of frontal area is important. In the A.R.III, Mark II, which is the machine now flying at Hanworth, this value reaches a high figure and has much to do with the good energy-assisted take-off and the shockless landing without preliminary glide which are features of this machine.

At its outer end the blade spar has screwed into it a

R(R CONTROL



View from above of the Hafner rotor hub, showing the "spider" with its one rigid and two hinged arms, the incidence cranks on the blade roots, and the internal piston which carries the bearings for the spider spindle and the joystick.

steel plug used for balancing purposes. The rotor blades are of aerofoil section over the outer two-thirds only, the inner third of their length being of plain streamline section. The main blade spar terminates at its inner end approximately at the point where the streamline and aerofoil sections merge into one another. From this point to the vertical rocking hinge fitting on the rotor head the centrifugal pull of the blade is normally taken not by a continuation of the tubular spar but by a steel tie-rod of relatively small diameter. This is, in fact, the "wire" of our theoretical blade suspension. At its outer end this tie-rod is screwed left-hand into the outer spar tube, and at its inner end it is screwed right-hand into the knuckle root fitting.

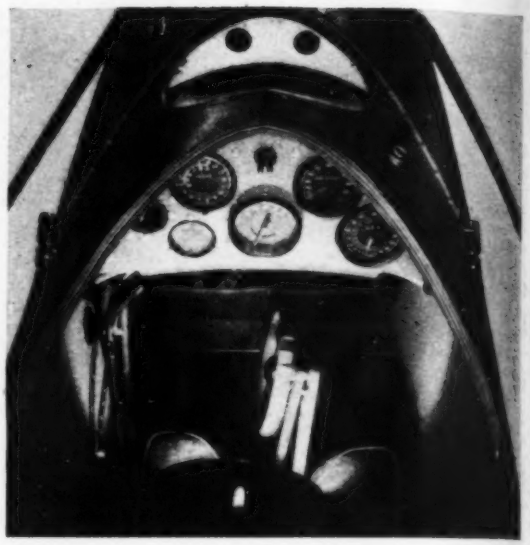
Precautionary Measures

The main blade spar does have a tubular inward extension, but normally this does not carry the centrifugal loads. The tube has a shoulder at its inner end, and the length of the tie-rod is so adjusted that normally the shoulder is just clear of a collar attached to the knuckle fitting. Should, however, the tie-rod stretch (through, for instance, over-revving of the rotor), or should it break, the shoulder of the tubular spar root will bear on the collar, and the blade will be secured against centrifugal pull. The friction will, however, be so great that the blade incidence will be locked, and the pilot will at once know that something has happened, as the rotor will become "rough" and his incidence control will be inoperative. That does not mean that he has lost all control, but merely that the machine will have to be controlled by the normal flying controls, viz., rudder and elevator; lateral control will, of course, be lacking, but it should be possible to land the machine without doing very serious damage. In any case, there is little likelihood of a tie-rod breaking, as its load factor both in tension and torsion is high. Fatigue might be feared, but experiments have shown that in view of the length of the rod and the small amount of twist to which it is subjected, there is little reason to fear trouble from this source. The spar root tube, it will be realised, serves to carry the blade in bending when the rotor is stationary, its inner end making a bearing but not a tension anchorage.

The rest of the Hafner rotor head mechanism is fairly straightforward. The hub is a partly conical bowl with an internal cylinder which carries the taper roller bearings by which it is attached to the rotor spindle. A fork or yoke forms the attachment of the blade root to the rotor hub. The three yokes are identical but unsymmetrical, the longer arm of each taking its bearing on the outer wall of the cone and its inner on the internal cylinder. The hinge pins are so arranged that their axes intersect the rotor axis and so avoid any couples about the centre of the hub, such as might arise due to unequal lifts of the blades in flight.

Pitch Adjustment

The spider which carries the three crank arms used for varying the incidence simultaneously on all three blades is carried on a spindle mounted in a piston which can slide up and down inside the rotor axle. The spider, of course, turns with the rotor head, but the piston is prevented from rotating, as is also the extension of the spider spindle which terminates in the joystick. A double-jointed arrangement is incorporated in order to provide the usual aircraft type of control, i.e., pull-for-climb, push-for-dive. The piston is moved up and down by means of a Simmonds-Corsey control, the operating lever of which is placed on the left-hand inside of the cockpit, its neutral and forward positions being locked by a pawl and teeth on a quadrant. The rearmost part of the quadrant is without teeth in order to compel the pilot to hold the lever back. This is done because this setting which corresponds to maximum pitch angle, is used for landing only and for the initial part of energy-assisted take-offs. As soon as the pilot releases this lever it moves forward automatically until the pawl engages with the quadrant tooth which corresponds to normal pitch angle.



Looking down into the cockpit of the Hafner A.R.III. On the left is the lever which operates the spider. In the centre the trimming wheel for the pivoted tailplane. The end of the joystick is out of sight below the instrument board.

The drive for starting the rotor includes a clutch and gear box unit, and there is, of course, a freewheel arrangement. The drive is interesting and has had a good deal of development work done on it, but, unfortunately, space does not permit of describing it in detail. It incorporates such refinements as a synchromesh device, and great trouble has been taken to protect the rotor head and blades against shock loads during the revving-up process. That this is necessary will be realised when it is pointed out that each of the three rotor blades weighs about 35 lb., and that the rotor is speeded up to some 240 r.p.m. for energy-assisted take-offs.

Steep Angle of Climb

A recent demonstration at Hanworth showed the Hafner gyroplane to leave the ground with a run of about two yards, the subsequent climb being very steep. Actual measurements are not available, but it is estimated that the A.R.III, Mark II, should be able to clear the standard 66ft. "screen" after a run from a standing start of about sixty yards. Actual official performance figures have not yet been established, but it is expected that the top speed should be about 125-128 m.p.h. and the cruising speed approximately 115 m.p.h. Owing to the amount of energy which can be stored in the rotor, landings can be made straight off the "sink-approach" with preliminary glide.

At an all-up weight of 890 lb. the machine carries 70 lb. of petrol and oil and 180 lb. of pilot and luggage. The duration is 1½ hours, or 170 miles in still air. The diameter of the rotor is 32ft. 10in. and the rotor disc area is 846 sq. ft. As each blade has an area of 6.68ft., the "solidity" is 2.37 per cent. The loading per sq. ft. of rotor blade area is 43.6 lb.

The A.R.III, Mark II, is regarded by the makers, A.R.III Construction, of 42a, Walmer Road, London, W.10, as a flying test bench rather than as a production type. Mr. Hafner, who has been responsible for all the technical research in this country throughout the development period, the partnership between him and Mr. Nagler having been dissolved some years ago, intends to use the machine for exhaustive flying trials so as to discover if there are any mechanical "snags" left in the mechanism, having already satisfied himself that the Hafner system of control is fundamentally sound.

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"Flight" photo.

SUPPLIED TO IRAQ—Part of the first formation of Pegasus-engined Hawker "Audax" leaving Brooklands.

[ADVT.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for publication in these columns.

RADIO CONGESTION

I WOULD like to reply to your correspondent "Aerop." The criticism contained in my article on radio congestion was not directed against experienced operators. Those who have a First-Class P.M.G. and some years' experience are obviously up to, or above, the standard suggested.

Whilst one airline has been recruiting only experienced men for the last few months, there still remain those who were employed before this policy was adopted. Is it too much to suggest that they were the reason for it being adopted? In any case, there are other airlines, flying almost parallel services and using the same frequencies, who are employing inexperienced operators.

The standard of the Air Wireless Licence is too low. It is much lower than that of the First-Class P.M.G., and practical experience of D/F. is not included in the syllabus. I know some holders of wireless licences who have never seen a D/F. except in a picture. Let one or two of these beginners be let loose on the air in QBI, and "Aerop" knows what will happen. All working is held up for an indefinite period, in spite of the best efforts of better men to get through. What about the operator (in a premier airliner) who, in QBI, insisted on getting his bearings as per P.M.G. handbook, two minutes per bearing, and ended by landing with the trailing aerial out? And what about that other, who sent R OK so that it came through as SOS, and held up everything for a long time? Again, there was the ground station operator who sent QTE 382, and had to be asked three times before he woke up. I heard him.

In spite of the good operators, the poorer ones keep the average pretty low.

As regards radiotelegrams, the P.M.G. handbook puts them last in order of priority, so that they would automatically be suspended in QBI.

I think this answers all the points which "Aerop" has raised, but if he wishes to continue the discussion further I shall be glad to communicate with him privately if he will write to me c/o the Editor. CRITIC.

Hampshire.

CONSTRUCTIVE CRITICISM

THE letters which appear from time to time in your correspondence columns on the subject of aircraft wireless operators have been read with interest by the writer, who hopes that the statements and suggestions which follow will give people on both sides of the fence something to shoot at.

There are two main reasons why air W/T. operators are lucky if they earn more than five to six pounds a week. First, airline operating companies have regarded the wireless operator as a necessary evil rather than as an important unit in keeping down their annual deficit, while many pilots have good reason to regard some of them as a very mixed blessing. Secondly, speaking generally, employers and pilots regard any holder of the Provisional Operator's Licence as an operator, irrespective of his experience. *There is no place in the operational crew of an airline machine for a man worth only £3 per week.*

This state of affairs has been aggravated by the 1st Officer W/Op. scheme, in which the Operator's Licence is only a means to an end, so far as the individual is concerned, the man taking no real interest in the operating side of his work; at such time as his experience renders him of real value as an operator he is given a command. In making the above statement I am not forgetting that small band of ex-operators, who, as pilots, are the exceptions that prove the rule.

Now, before examining the various ways by which an operator can increase his value to his employer, let us endeavour to forecast some of the developments which may be expected during the next few years, and their effect on the work of the operating crew of an airline machine.

1. An increasing block-to-block speed up to, say, 320 km./hr.
2. General fitting and use of blind-approach receivers and, later, blind landing.
3. Efficient de-icing equipment on all machines.
4. All aircraft equipped with D/F. facilities on board and a system of triangulated omni-directional beacons, as used in the marine service, on the ground.
5. A system of V.H.F. route beacons giving continuous directional guidance along the main air routes.

As a consequence of these advances in technique it can be anticipated that frequency figures and maintenance of scheduled times will seldom depart from 100 per cent., provided the crews are efficient. How can the necessary standard of efficiency be attained?

It is considered of vital importance that crews should be trained as such. Every pilot has his own methods of tackling a certain job of work, and with the added complexity of the modern transport aircraft any unit of the crew doing the wrong thing at the wrong moment may have serious consequences. Only by mutual trust in the abilities of each unit of a crew can high efficiency be obtained.

On board the machine in flight there is only one person who is able, by means of the apparatus at his disposal, to obtain a complete picture of what is happening in the area in which the machine is flying, and that is the wireless operator. Furthermore, if he is a GOOD operator he is the only one able to maintain (with minimum delay) in his mind's eye, the ever-changing picture of the weather over the area in which he is flying. He reads the code reports as they are broadcast and so brings the picture up to date. If he has to write it all out and pass to the captain, the machine will be twenty miles on its way before the information is appreciated. Similarly, the only man who must have minute-to-minute knowledge of the exact position of the machine is the wireless operator. In the event of distress, the pilot will be far too busy to give an accurate position, that is if he happens to know it; the operator with his D/F. equipment can and will.

In my opinion, the captain of a modern machine, although relieved by the auto pilot of the mechanical duty of flying, has such a mass of apparatus to keep check of, that it is desirable that certain of the navigational duties be delegated to the wireless operator, as being the most suitable man.

In order that this may be accomplished it is suggested that the whole system of licensing be revised, and three grades of Operator's Licence be instituted, as follows:—

A 2nd Class Licence having the standard of the existing provisional licence and restricted to use on internal airlines by day or ex Europe.

A 1st Class Licence, calling for a test at 25 w.p.m., a higher technical standard and at least 1,000 hours' air experience.

An Extra 1st Class Licence, the standard as for previous licence, but requiring 3,000 hours' air experience and an examination up to the standard of the 2nd Class Navigator's Licence covering Form of the Earth, Maps and Charts, D/F. and D.R. Navigation and Meteorology.

It is also considered desirable that the holder of a 1st or Extra 1st Licence should also hold the proposed Wireless G.E.'s Licence.

A comfortable operating position, with equipment conveniently placed, provision for working "Break In," and volume controls on *all* receivers would do much to improve the efficiency of aircraft wireless stations.

Croydon. H. W. HAMBLIN,
WIRELESS OPERATOR.

"THRESHOLD" LIGHTS

IT was with pleasure that I found in your issues of *Flight* of February 4 and of January 21 that mention was made of the new boundary and "threshold" lights which have been installed at Eindhoven. I am very obliged to Mr. A. T. Vulliamy, who was kind enough to mention these Philips sodium-discharge lamps as a perfect means of indicating the outlines of an aerodrome. As you will doubtless know, these yellow lights comply completely with the recommendations of the International Committee on Illumination, which had its International Secretariat in England for quite a long period until, in view of the international meeting to be held at The Hague in 1938, it was transferred to the Netherlands.

A limited range of wavelengths for this "aviation yellow" light—which must be emitted by boundary lights only—has

been fixed, and the sodium-discharge lamps in question, of only 50 watts, produce this light without the use of any coloured screen whatsoever. By its special characteristics it proves to be a most ideal light-source, giving a powerful though not dazzling and very penetrating light, even under adverse weather conditions.

I am, however, afraid that the note accompanying the picture of one of these Philips boundary lights will be somewhat misleading, it being stated that they are used to indicate "aerodrome runways." This, however, is *not* the case. When I planned the layout of the new lighting equipment of the Eindhoven airport I followed the recommendations of the I.C.I., mentioned above, and put all aviation-yellow boundary lights 100 metres apart. Under very bad weather conditions, when landings will have to be executed by means of the radio beacon, I was quite convinced that the distance of 100 metres between the boundary lights might prove to be too big. This made me "fill up" these distances at two opposite sides of the landing-area where the radio beacon course line crosses the boundary. On these particular spots the boundary was indicated by ordinary boundary lights at only 25 metres apart so as to enable the landing pilot to observe the boundary with complete certainty even under the poorest visibility before throttling down and gliding in. This made me coin the expression "threshold of light," which the pilot, guided by the radio beacon, has to pass. As a matter of fact, these auxiliary lights are a completion of the normal boundary lighting, and are not exactly what are called "approach lights." *These* ought to be aviation-green. The Eindhoven "thresholds" are only intended to be a further help to the landing pilot when it is necessary to follow the radio beacon course line. So much for that.

Actually, these particular Philips sodium-discharge lamps are not of the so-called "high-pressure" type. These do not exist in the sodium type. Perhaps the writer has been mistaken, for at this airport there are new landing lights fitted with the powerful and very economical high-pressure *mercury*-discharge lamps consuming only 900-1,000 watts, and, placed in an ordinary cylindrical parabolical mirror, giving a hitherto unknown quantity of bluish light. These lamps really are of the so-called "high-pressure" type.

Eindhoven, Holland. R. J. CASTENDYK.
Manager, Eindhoven Municipal Airport.

THE CROYDON RESIDENTS

THE letter of "Good Villager," of Hillcrest Road, Croydon, in *Flight* of February 4, deserves a reply, for it is founded on a series of misapprehensions.

At this airport there is no lack of sympathy with residents on the only piece of high ground bordering the aerodrome. It is realised that in such circumstances lower flying is inevitable over high ground and that, in consequence, more noise and alarm will be caused to dwellers on the ridge than to those living elsewhere. The hill is a source of anxiety to air transport people and every effort is made to prevent the residents on it being unnecessarily alarmed or annoyed.

The problem is that this airport, the sixth most important passenger port, shipping included, cannot but become busier as years go on, both by day and night. That is the fact we all have to face, and that is why we all sympathise with Hillcrest Road and neighbouring residents.

I do not scoff at the residents, but I definitely scoff at those who got up the petition for not verifying their facts before doing so and for unnecessarily alarming the other residents by painting far too black a picture.

There are points in this "memorandum" equal in absurdity to a couple of recent (and quite seriously made) complaints. One was that a large British machine was seen to dive under some telegraph wires and the other was of a certain foreign monoplane passing down a tree-bordered road below the level of the tree-tops—this allegation being made in spite of the fact that the particular machine's wing span would have rendered such flying a physical impossibility.

The "manifesto," as its authors call it, refers to "regulations as to taking-off which used to be in force, which have either been relaxed or have been allowed to be ignored." In this there is no atom of truth, but as those who issue public documents are assumed to have verified their facts, it is not to be wondered at that people reading such a thing are thoroughly alarmed.

Another serious inference is contained in the words, "It is understood that whilst pressure can be brought to bear on British pilots to prevent a risky start, no such power exists when dealing with foreign pilots." Now, that is unmitigated nonsense and casts a monstrous aspersion on the admirable organisation of such companies as the German Luft Hansa, Swissair, K.L.M., and the others. Can anyone in his senses suppose that every air transport company does not dread an accident above all things and takes every precaution humanly possible to prevent one?

Another sentence in the manifesto is illuminating: "We think it imperative that there should be some control to prevent all pilots, whether British or foreign, from taking undue risks." It is assumed, you see, that undue risks are taken. This is definitely untrue, and one wonders what sort of mental picture of the average airline pilot could have been in the minds of those who gravely penned those words. Most pilots on the London routes, British or foreign, are men of forty or so, with some ten or fifteen years' daily flying experience. Almost all are married, with homes and children. Flying is their profession and they have that gravity of outlook which comes from continuous, heavy responsibility. In making their decisions they have to consider the lives of their passengers and crews, their own professional reputations and the reputation of their companies, the high value of the aircraft under their charge and, incidentally, their own lives. If you would not expect the manager of a celluloid factory to start dropping lighted matches around, why should you suspect an airline pilot of making "risky starts"? Even if (quite incredibly) they wished to risk everything on a wild gamble can any reasonable being suppose the company employing them would stand calmly by and allow it?

Lack of any attempt to ascertain the true state of affairs is also responsible for the persistence with which the K.L.M. accident is, in general, linked up with flying over Hillcrest Road. In the minds of those responsible for the petition, and also in that of "Good Villager," is the desire to prevent a recurrence of that accident. In order to allay unnecessary anxiety, I feel it is therefore desirable to point out that this accident was absolutely exceptional and analogous to a train leaving the rails for some unexplained reason and crashing into houses adjacent to the line, but at right-angles to its preordained course. The white line is carefully designed to steer aeroplanes away from Hillcrest Road and to bring them over a neighbourhood clear of all such obstacles. The accident is the first of its kind in the history of the airport, and its recurrence is extremely unlikely.

It is because all these things could have been known to the "petitioners" if they had but enquired, that I called the petition an example of prejudice against commercial aviation.

Croydon. A. VIATOR.

MASS CONSUMPTION

MAY we beg a little space in your columns to reply to your correspondent who rather aptly depicts himself as "Headlight"? He has caused quite a stir in our little nest. He infers that those who can only just afford the £100 aeroplane (when produced) should not be allowed to pilot, and states that this is *not* snobbishness. Who will agree that the owner of a posh car is not snobbish when he voices his summer Sunday wish that the man with his £100 car should be deprived of his pleasure? It might almost be termed a definition of snobbishness.

We are doing pioneer work in carrying out instruction at 15s. per hour on the cheapest type of machine available, and resent an attitude which, fortunately, was not in the minds of the Gorell Committee.

"Headlight" obviously has not experienced the joys of the ultra-light pusher aeroplane being flown for pleasure only, and with flying characteristics which, to any experienced pilot, create a complete indifference to engine failure. With ground training, our pupils go solo, in so far as ground hopping is concerned, after an average of 2½ hours' instruction, and make their first solo circuit after an average of only six hours' instruction. We are confident that this pupil, after ten hours' instruction and with an "A" licence, is safer to himself and to others than a pupil trained on the orthodox type of club machine and with twenty-five hours to his credit.

It is only human nature that people like "Headlight," who have afforded the necessary cash for expensive tuition, should look down their noses at the others, but it is experience which makes the safe pilot, so why should not experience be purchased cheaply and safely on a low-powered machine, under a competent instructor from the ground? To keep flying exclusive for the snobs? H. R. DIMOCK.
Ely Aero Club.

Each week we receive more letters than space permits us to publish. We would once again urge correspondents to keep their arguments brief and to the point, thus assuring a more representative exchange of opinions.—Ed.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

HIGH-DIVER : The new Blackburn dive-bomber fleet-fighter, the tail of which should be compared with that of the Vultee below; the relative positions of rudder and tailplane are transposed.

IT takes about 5,300 feet of wiring to connect up the various electric circuits in one of the new Douglas D.C.3 transports.

One version of the latest Stinson Reliant, handled over here by Brian Allen, cruises at 161 m.p.h. with a 320 h.p. Wright Whirlwind.

Brief specifications of the Vought SBU-1 scout bomber biplane, as used from American aircraft carriers, are: span 33 ft. 3 in., gross weight 5,318 lb., top speed 205 m.p.h. at 8,900 ft., landing speed 65 m.p.h., and service ceiling 24,600 ft. A retractable undercarriage has been fitted experimentally.

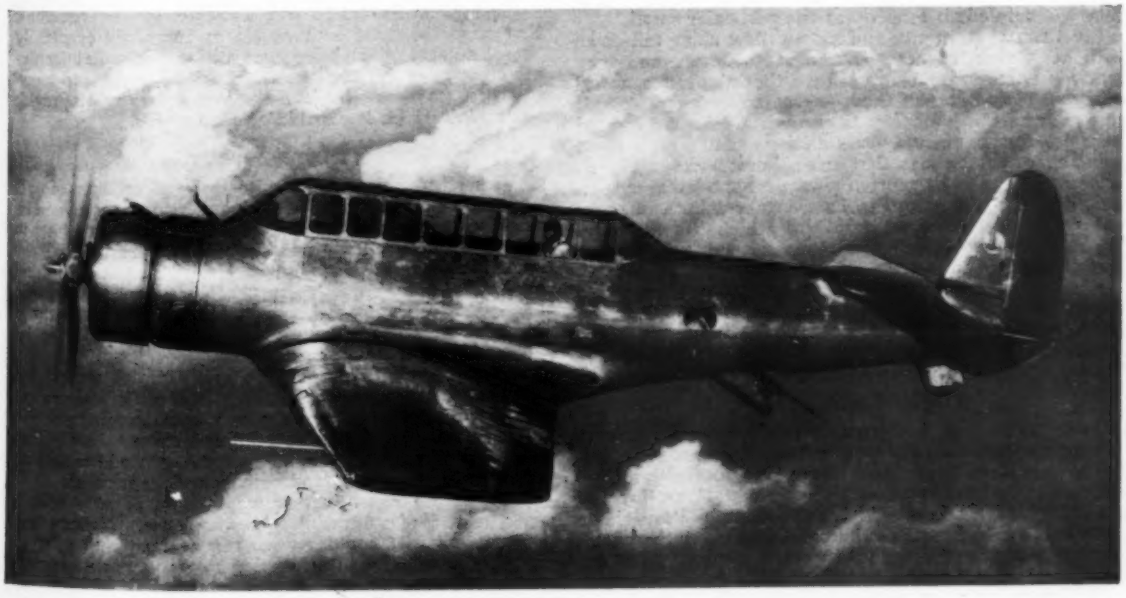
Preliminary specifications for the Lockheed "14," or Super Electra, powered with two Wright Cyclone G engines, have just been issued. A maximum speed of 265 m.p.h. at 8,700 feet is expected, and the machine should cruise at 240 m.p.h. at 12,000 feet using a total of 1,200 h.p.

The "14," for which the agents in this country are Rollason Aircraft Services, of Croydon, will take off in eleven seconds, taking 875 h.p. from each engine, and at its full gross weight of 15,000 lb. will reach an absolute ceiling of 26,300 ft. On one engine the ceiling is expected to be a good 14,000 ft.

The annual general meeting of the Royal Aero Club takes place at 119, Piccadilly, on Wednesday, March 24, at 6.30 p.m.

Notices for the agenda, signed by at least five members, must be received by the secretary within twenty-one days of the meeting, and Committee nominations within fourteen days.

At the annual meeting of the civil aviation section of the London Chamber of Commerce last week, Lt.-Gen. Sir George Macdonogh was appointed chairman for 1937, whilst Lord Greenway and A.V.-M. A. E. Borton were elected deputy chairmen.



LOW-FLYER : The latest version of the Vultee attack-bomber, which is suitable for ground strafing. Note the empennage and lower gun. Orders have been placed by China, Russia and European and South American Governments.

Topics of the Day

These Ultra-lights

MANY months ago I suggested that if there was one thing which would hold back development in the ultra-light market, that thing was the lack of really suitable power units. After flying a few more examples I have seen no reason to alter that opinion.

Easy to fly, and safe as most of them are—as aeroplanes—my experiences have often been spoilt by an entire lack of confidence in the reliability of the engines fitted, and by the lack of power provided by them for climbing propulsion, even when they have been running quite well. Let it not be thought that I expect too much from the little fellows, but many of them are grossly under-powered for safe departure, in a flat calm, from any aerodrome of less than the thousand yards' calibre.

It is all very well to say that these machines are usually meant only for aerodrome flying or for short trips in good weather, and, at the same time, that they are designed for use by novices. Aerodrome flying demands, above all things, a good take-off, a fair climb and a reliable engine, and a novice is the last person to be able to deal with deficiencies in any of these. Some of the ultra-lights of which I have had experience are so under-powered that they will only climb properly at one particular speed.

Fly them at 40 m.p.h. and they wallow along tail down without gaining height; fly them at 50 m.p.h. and they scrape the tree-tops. Don't tell me that a novice can deal safely with that sort of thing—even if the engine *doesn't* stop just as the boundary is crossed. Near the ground they are temperamental little affairs and their strongest point concerns the fact that trees, houses and telegraph poles are likely to be smitten always at sub-lethal speeds. It is depressing, anyway, to be overtaken, both in speed and climb, by some mediocre bird which has taken off at the same time as oneself and turns on its way to give you a pitying glance.

Nor is there anything very remarkable about low-power flying. In the long-ago Lympne trials the E.E.C. Wren flew quite well on an A.B.C. motor cycle engine developing a maximum of 10 h.p., and a little later the first Daimler-Klemm carried two people on 20 h.p. at 62 m.p.h.

Unreliability

IF you think that I am exaggerating when I speak of unreliability let me ask you, first of all, how many ultra-lights have been made and flown here in the last two years. Excluding Drones and the defunct *Poux*, perhaps ten. Of these, two which I have actually flown have since been crashed, with considerable damage to the pilots, through sudden engine failure. That, I may say, is a very poor average. Aeroplanes almost did better in 1914.

Until somebody produces real aero engines in small sizes I shall prefer, in most cases, to face the ridicule of braver souls by flying, pleasantly enough, within approximate gliding distance of an aerodrome. I demand an aerodrome because it is not safe to make forced landing approaches into small fields with machines on which side-slips cannot be held and on which steep gliding turns are sometimes made abominable by the low-speed effect of aileron drag.

After several hours in any one of these ultra-lights a pilot would undoubtedly learn to pull off reliable spot landings without using his engine, but the ability requires semi-sailplane experience which can only be acquired with practice—and which has not yet been acquired by me. At present when I want to gain height in an ultra-light all the down-draughts conspire against such a project, yet, when I reach the proximity of the aerodrome and wish to descend, it appears that I have found all the up-draughts in the district.

None of which forms a criticism of ultra-light machines as such. One or two of them have safe and pleasant characteristics which might well be applied to our standard light aeroplanes and are certainly worthy of better means of propulsion. Others, in their own different way, are more difficult to fly than the aeroplanes which are popularly supposed to be beyond normal capabilities.

The manufacturers of play-planes must also remember that even the most enthusiastic amateur will eventually tire of a game which affords no variety, and that for flying enjoyment, *per se*, there is probably nothing to touch soaring. Consequently, these manufacturers must provide a machine which is capable of serious work.

More Power

FOR such machines we require real and reliable engines in two sizes, for single-seater and two-seater or sports-single-seater work. The first might develop something in the region of 30 h.p.—genuine and continuous—and the second might be in the 50-60 h.p. class. The latter demand may eventually be filled by the Weir, and already the Czech Walter Company produces, in addition to the little Atom engine, the Mikron four-cylinder, which more or less satisfies the requirements.

I should hate to prophesy a really useful market for either size, but there should be a sale of a hundred engines a year for each after the airframe manufacturers have had a chance to design machines around them In the first year sales would probably be limited to the odd twenty or so fitted to prototypes and demonstration machines.

The private-owner market would only develop after a year or two of successful solo school use. Nobody but a super optimist could expect the average club pilot to spend a sum—large in proportion to his payments in club and other hire charges—for a machine which has not shown that it is both reliable and inexpensive in upkeep.

INDICATOR.

FROM the CLUBS and SCHOOLS

WHY NOT? The seaplane has a certain very definite popularity in the States, and such small fry as the Aeronca have been successfully used with floats. When is someone going to start a seaplane or amphibian club over here? Even at high dual and solo rates there should be some very fair support if the club is based on a pleasant part of the coast.

LONDON

CLUB aircraft flew 70 hr. 10 min. last week. New members are Messrs. A. H. Curtis and J. A. Crosby-Warren. Messrs. R. Wilson and I. Westmacott have completed the tests for their "A" licences.

REDHILL

Members of the Redhill Flying Club flew 55 hr. 35 min. during last week. Mr. Brunfitt has passed his "A" licence tests, and a special police anti-gas lecture will be held at the clubhouse tomorrow (Friday) at 8.15 p.m.

CAMBRIDGE

Flying times at Marshalls' Flying School for the week ended February 14 totalled 60 hr. 30 min. Mr. Fisher joined the School, Mrs. Knight has had a trial lesson and Mr. English completed his first solo. Cross-countries were flown to Hatfield and Sywell.

NOTTINGHAM

Time for the week ended February 11 amounted to 17 hours. Mr. G. L. C. Bagshaw has joined the Club as a flying member, and Mr. W. M. Wild as an associate member. Two new private owners are Mr. W. J. Martin, who has purchased the Swallow G-AECY; and Mr. Bradley, who now owns the Miles Hawk, G-ACOC.

C. A. S. C.

Members flew 10 hr. 15 min. last week-end at Fen Ditton, Cambridge. One hour twenty minutes was flown by members attending at Gravesend airport, where Mr. R. T. Dew was supervising the first attendance of No. 4 (Kent) Squadron. Mr. S. Hart has recommenced his training with the Corps after an absence of twelve months.

WITNEY AND OXFORD

Ten hours were flown during the week ended February 13. Miss B. E. Longmore has joined the Club for a short navigation course. A new mess for the pupils of the Witney Aeronautical College is being built and should be ready in about three months. The whole of the Witney hangar is now available for the various activities at the aerodrome.

NORFOLK AND NORWICH

Mr. M. G. Bircham's occupation at Doncaster has left a vacancy in the House Committee, but Mr. C. R. Colman has consented to take his place. A new pupil is Mr. G. B. Calvert, who commenced his instruction last week under Flt. Lt. F. T. K. Bullmore. Visitors during the week included Mr. R. Rowbotham from Waltham Flying Club in one of this Club's B.A. Swallows. The tenth anniversary dinner will be held on Thursday, February 25.

HANWORTH

Last week's flying totalled 41 hr. 50 min., first soloists being Mr. J. Stone and Mr. Padgett (National League of Airmen), while Mr. H. Vilen has passed his "A" licence tests. The Club was honoured with a visit by H.R.H. Infante Alfonse of Spain. He was accompanied by Sir George Louis. His Royal Highness has not flown for some considerable time and now intends to take his "A" licence at the Club. Sir George arrived in his Percival Vega Gull and hired one of the Club Moths—he has not flown this type of aircraft for many years. Both H.R.H. Infante Alfonse and Sir George, along with Mr. B. S. Lowe, have joined the Club as members. Among new private owners is Mr. Silcock, who is housing his Swallow at Hanworth.

BORDER

The continuance of the aerodrome levelling and drainage scheme is seriously handicapping the activities of the Border Flying Club. Red flags are dotted over large sections of the landing ground, and visiting pilots are requested to exercise care in landing.

YORKSHIRE

Despite bad weather, Club machines flew fourteen hours during the week. Visitors to the Club were Mr. R. Malone of Airwork, in a Miles Whitney Straight (G-AERS) for demonstration purposes, and Mr. G. Braithwaite, of the Newcastle Aero Club, in a Moth (G-AAJS).

SOUTHEND

Flying was curtailed during the week owing to bad visibility. The Club welcomes a new member in Lord Sempill. A special "Sixth Birthday" dance will be held at the Club on February 27, and a cinematograph exhibition of "The History of the Club in Pictures" will be given on February 20.

MIDLAND

New members last week were Messrs. E. H. Jones, W. Breedon and G. Mayer. Mr. and Mrs. A. Ellison recently left in a Puss Moth (G-ABYU) for the Oases Rally. Flying had to be cancelled on three days of last week owing to bad weather bringing the total down to seven hours dual and five hours solo and passenger.

LEEMING

The total flying time at York aerodrome for the week ended February 13 was 29 hr. 20 min. The Yorkshire Aviation Services Country Club held their third annual dinner dance at the Grand Hotel, Harrogate, on February 10, the attendance numbering nearly 200. Reference was made in the speeches to the success of the Club, and of the coming International Aviation Meeting to be held in June. Mr. W. K. Liversidge has qualified for the renewal of his "A" licence, while Mr. Oakland has gone solo.

CROYDON

Flying time for the first fortnight in February was well over 50 hours. This is a considerable increase over the corresponding period of last month. The Dragonfly is becoming very popular—at least six "B" licence pupils are receiving dual. Arrangements are being made to be "at home" to the Dunkirk Flying Club in the near future and it is hoped that many members will co-operate to make the occasion a success. Subsequently a return visit will be paid by this Club. An "A" licence scholarship scheme has been inaugurated.

BROOKLANDS

Sunday's weather report vouchsafed the information that there was Q.B.I. at Heston, Croydon and Gatwick, and that a large number of other aerodromes were suffering from waterlogged conditions. None of this was applicable to Brooklands, however, and though the aerodrome surface *was* a little soft, flying was in full swing all days, some 16½ hours being flown, this bringing the week's total to 60 hours. During the week Messrs Hartmann and Huipers started flying, and Dr. Sansome successfully passed his height test. The sales department have supplied two machines, a Gipsy II Moth to the Hon. V. Hely-Hutchinson, and a Miles Whitney Straight to the Hon. T. Fermor-Hesketh. The latter, after a few minutes' dual with Mr. Ken Waller, took the machine up solo. The Duke of Richmond visited Brooklands during the week in his B.A. Swallow; another welcome visitor was Mr. Lloyd Mainwaring.

Private Flying

SOUTH COAST

Better weather enabled the Club to do over 40 hr. flying last week. This is a record since last summer. An informal dance is being held at the Club on Saturday next, the 20th.

EASTBOURNE

Two "A" licences were taken during the month of January by Miss Strodle and Mr. Eric Ellis, and the number of hours flown for the month amounted to 41 hr. 5 min., despite the very unfavourable weather conditions. Since 1933 some thirty-four "A" licences have been taken under the instruction of Capt. H. A. Love and there is a total membership of 180. Improvements are now being carried out, including extensions to the clubhouse and additional hangar accommodation.

NORTHAMPTONSHIRE

During January members of the Northamptonshire Aero Club flew twenty-nine hours. Miss B. E. Benson has gone solo and is now making headway for her "A" licence. Mr. J. W. Wilkinson, who has his "A" licence for Autogiros, has now done all the tests for the fixed-wing type of aircraft. Mr. Gallagher has also completed his tests for a licence to fly ultra-light aircraft. The next Club dance will be held on March 5, and the annual general meeting will be held in the clubhouse on Friday, March 12, at 7 p.m. New members welcomed during the month include Miss J. K. Bull, Mr. and Mrs. Woodman, and Messrs. G. S. Bull, H. G. White, and the Hon. A. Verney Cave.

CINQUE PORTS

New members joining the Club last week were Mr. Knight, from the Small Arms School, in order to obtain his "A" licence, while Mr. Brand went down Lympne for final polish on the Club's Tiger Moths before going to Hendon for his "B" tests; he also intends to do his night flight with the Club. Messrs. J. A. Reid and J. C. Bridger have successfully completed the tests for their "B" licences.

A foreign visitor during the week was Mr. Provost with friends from Belgium in the former's Leopard Moth. He is off to the Egyptian Rally and wanted a special check on his machine before starting. Another visitor was Mr. G. Gardner, who landed at Lympne on Friday about midday, having been to Paris and back that morning in his new Beechcraft at an average speed somewhere in the neighbour of 190 m.p.h.

Bücker for Zurich

THREE Bücker Jungmeisters should by now have left for the International Aerobatic Contest at Zurich. Each is fitted with S.H.14A (presumably Siemens) engine.

Incidentally, the Dornier Co. have obtained a licence to build the Jungman at Altenrhein, in Switzerland.

Not at all Technical

FOR some reason or other the annual D.H. Technical School ball always provides one of the very best opportunities for certain sections of the flying fraternity to get together.

This year the event coincided with the A.I.D. dinner and there were certain notable absentees, but the number of guests (self-made and otherwise) was so satisfactorily enormous that these absentees were only noticed towards the end of a very pleasant evening. Incidentally, the entertainer, who, among a number of other light-fingered tricks with cards and so forth, managed to remove a guest's braces without his knowledge, would be a useful addition to any aircraft factory. He could, for instance, remove the bugs from some new type without the knowledge of the design staff—who usually doubt the presence of these small insects.

COMPASS ERRORS EXPLAINED

The Why and Wherefore of the Various False Indications

NOT every instructor and compass expert will agree with the pitching and acceleration error explanations given in this short article. The whole subject, however, is one which is rarely dealt with in useful detail, and the explanations are at least interesting.

DURING straight and level flight at a constant airspeed, the magnetic compass will always give accurate indications, but any departure from these conditions may, as every pilot knows, cause the compass to give false readings. These errors are caused by alterations in the machine's course, speed or attitude, and a brief description of the forces to which the air compass needle system is subject will simplify the explanation of these errors.

In Britain, if a magnetic needle is suspended at its centre by a thread it will not lie in a horizontal position, but its northern end will dip down. In the Southern Hemisphere the other end would dip, and at the Equator the needle would be horizontal. The amount of dip increases as the needle approaches the magnetic poles of the earth. When a compass needle is mounted so that it already lies in a horizontal position the vertical force is always acting upon it, and it will dip at the first opportunity. In addition to this vertical force, there is the horizontal force which is used for direction-finding. This directive force, as it is called, is also variable, being greatest at the Equator and least at the magnetic poles.

The vertical force is overcome in the case of normal compasses by suspending the needles so that they are below the pivot point, making the system pendulous. Gravity then neutralises the force so long as the needle system is not tilted.

When a machine is turned in flight an error is produced, and the extent of this error depends upon the direction in which the turn is made and the amount of bank applied to the machine. It is at a maximum on steep turns through North or South, and at a minimum on slow flat turns through East or West. The reason for this is simple. In a normal turn the machine is banked and the compass and its needles also bank. This means that the needles are tilted out of the horizontal, so that their North ends are pulled downwards by the earth's vertical force and the needles rotate around the pivot.

Consider a turn from North-west through North to North-east, i.e., to the right. The aeroplane is banked, port wing high, and the north ends of the needles move downwards, also to the right. If machine and needles turn at the same rate, as in a normally banked turn, then no turn will be shown on the compass. In a very steep turn the needles will even turn faster than the machine, and a turn in the wrong direction will appear to be being made. If the turn is made without bank a similar effect is produced, for the needle system skids outwards from the pivot and tilts, with the high side on the outside of the turn as in a banked turn. A turn in the correct direction is shown, but it appears to be of a small amount. On all northerly turns, in fact, the compass appears to be sluggish.

On southerly turns the opposite effect appears and the compass quickly responds to the slightest movement of the controls, always showing a greater turn than that being made. The cause is exactly the same as for northerly turns, i.e., the tilting of the needle system. Consider a turn from South-west through South to South-east, i.e., to the left. The aircraft is banked and immediately the North ends of the needles are drawn downwards, showing an apparent turn to South—in the correct direction. Similar reasoning to that used for northerly turning error shows that on all southerly turns the compass overestimates the turn.

Acceleration and Pitching

Errors due to a change of speed are most pronounced when steering East or West by compass, and are negligible on northerly or southerly courses. Consider what happens when a machine, which is flying East, increases its speed. Because of its inertia, the needle system swings backwards away from the pivot. It tilts with the higher side aft. The vertical magnetic force draws the North ends of the needles down, so they swing to the right, or to East, which makes the machine appear to be turning to North. A reduction of speed will have the opposite effect—an apparent turn to South being shown. On westerly courses similar effects are observed—acceleration causing an apparent turn towards North and vice versa.

Pitching error is also observed for the most part on easterly or westerly courses. When the nose of a machine rises the needle system is momentarily tilted out of the horizontal and the North ends of the needles are dragged downwards towards the tail. An apparent turn towards South is registered, similar to that caused by a reduction in speed. When the nose falls, or the machine goes into a glide, the opposite effect is shown. The fact that acceleration and pitching downwards (or deceleration and pitching upwards) cause errors in the same direction means that when these occur simultaneously their effect is very great and a very big error may arise.

These errors occur only at a time of change—change of course, of speed, or of attitude. When steady conditions are resumed, the compass will always register correctly.

J. A. McGILLIVRAY.

NOT SO ARCTIC

Some Thoughts on Winter Flying in the Modern Style : Interesting Weather Figures

By "INDICATOR"

TIME was when the average motorist solemnly wrapped up his car and put it away in the garage for the winter months. That was to save the cost of licensing. The aeroplane owner still tends to do much the same thing, and certainly does not consider the purchase of a new machine until the spring. He has a much better reason for looking on the winter months as "out of season," since the flying day is so comparatively short.

Nevertheless, it is possible to put in some very useful and pleasant flying during this period, provided that plans are not made too firmly in advance and that one is flying a cabin aeroplane. The Meteorological Office can give you a very good idea of the sort of weather to be expected during the next thirty-six hours, but beyond that even their skill and experience is of little avail.

Nowadays there is no need to fear the discomforts of cold weather, or the embarrassments of a multiplicity of garments. Recently I made two useful day trips in weather which, at fifteen hundred feet, would have been desperately uncomfortable in any open type. In a Hornet Moth's cabin I flew, for the most part, without coat or gloves.

Now and Then

Since becoming cabin-conscious during the past three years I have often wondered how I managed to do any navigating at all with numbed gloved hands in an open cockpit. My last real flight in an open trainer started auspiciously with the complete loss of a map section which had been temporarily accommodated in a cubby-hole above the dash; previously I had lost a glove down the fuselage, after suffering the annoyance of fogged goggles while taxying out. Yet somehow we managed to get about the country in the bad old days with very fair success, though at a great cost in the replacement of sodden maps.

The secret of success and mental composure in this business of winter flying is the study of meteorological reports. If you are in any doubt at all, ring up the Air Ministry; but the excellent system of broadcasts now carried out on 1,181 metres from the old Daventry station should generally relieve you of this necessity, unless you plan a trip involving more than one day's flying. My usual scheme is to listen to the general forecast at 8.45 a.m. and then to the station reports at 9 a.m. and 9.15 a.m.; but if an earlier start is demanded, station reports can be heard from 7.15 a.m. onwards and a forecast heard at 7.45 p.m. on the previous night. The station reports will not help a very great deal, since the conditions may have changed by the time you are due to fly, but they will at least give you some idea of the possibilities. For an afternoon trip, there is a general forecast at 11.45 a.m.

Some months ago I made up my mind to use these broadcasts to tabulate the number of days on which useful flying throughout the country was possible between October 1 and March 31, but I missed so many days that the project was abandoned. However, a very general examination showed that in the months of November, December and January cross-country flying to a definite destination south of the Tweed was safely possible on 25 per cent. of the days, though probably a departure from or an arrival at Croydon, Heston and certain industrial area airports where smoke-fog is often suffered could not be guaranteed on more than two-thirds of these. A table providing really accurate information would have involved a detailed dissection of the station reports throughout each day.

Flights to and from aerodromes lying outside the London controlled zones, and covering only the south of England, were possible on a further 35 per cent. of the days. Pilots housing their machines in other parts of England would probably find that flying was possible on a similar number of different days. On the remaining 40 per cent., visibility of less than 2,000 yards or a cloud-base lying below 500 ft. would have virtually precluded anything but aerodrome flying—and that only in certain areas.

The ability to fly usefully on a quarter of the number of available days is not, perhaps, very encouraging to the man-in-the-street who hopes that aeroplanes will eventually be used like cars, but it does suggest to the initiated that an aeroplane is not without real value even in the worst months of the year. The two trips previously mentioned would not in any case have been possible in the time at my disposal by any other means of transport.

One unpleasant fact connected with flying conditions generally is that year by year they appear to be deteriorating. The only reliable figures are those provided by a few clubs and schools, but, when allowances have been made for instructors' fondness for golf and other hobbies, these certainly suggest that we are going through a phase of really poor flying weather. This, however, cannot be expected to last, and the 1937 winter may show an improvement which entirely balances the temporary deterioration.

Deterioration

The effects of properly ordered commercial flying operations with the controlled-zone rules probably cause Heston's school figures to be slightly below those attainable at some other training centres, but the actuality of the general trend cannot be denied. At Heston the average number of flying days per month during the years between 1933 and 1936 has descended from 23.5, through 20 and 18, to 14.3. Last year, out of approximately 310 days on which school flying was officially possible, only 172 days were climatically possible. In 1933 the figure was 281. During the four years the best months were July and August, and the worst was December. Nevertheless, if in this worst month solo pupils could fly on an average of 11.7 days out of 25 or so (allowing for Christmas and the weekly holiday),

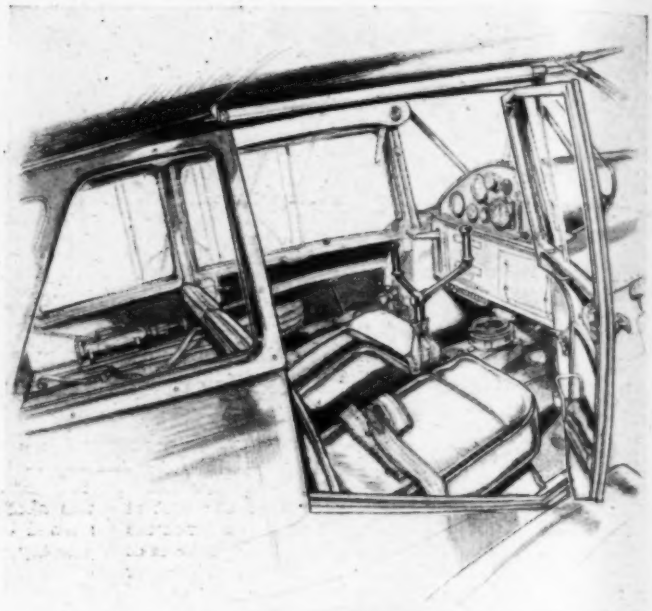
then flying is still worth while during the winter.

Certainly my most pleasant cross-country trips have been carried out during this evil season. The air is as smooth as silk, and an enclosed machine should be pleasantly cool without being cold. On at least one day this winter it was possible to see for thirty miles along the South Coast. I sat in a Hornet Moth's cabin, dressed as I would be in a centrally heated flat, with hands and feet off the controls, admiring the view and endeavouring to pick out places of interest.

At that period about half the aerodromes in the country were partially flooded, and I was glad of the exceptionally short take-off and landing, and of the safe endurance of more than five and a half hours on one tank-full. At one well-known aerodrome an area about 300 yards square was all that was safely available for use, and I had previously been quite uncertain whether another aerodrome was fit for landings; had it been under the weather I might have been glad of the Hornet's endurance on full tanks—if only to save me from an unpopular descent on an R.A.F. aerodrome for a safety-first refill.

This endurance business is most important in winter flying. After the best of weather reports it sometimes happens that one's destination is un-get-at-able later in the day and it is comforting to think that one *can*, if necessary, stay in the air for such a useful period. Anyone who has suffered a combination of thick weather, fading daylight and a zero-swinging fuel gauge will appreciate such mental comfort. Since one often flies throttled well back and cruising at, say, 60 per cent. of the maximum speed, while traversing thick patches, it is endurance which counts. A long range obtained through the medium of a very high cruising speed has not always the same intrinsic value in such conditions, though this high speed will certainly help you to travel quickly to a better area—so long as you know where that area is.

Incidentally, while nobody minds plugging along through thick weather with better weather ahead, I am strongly against carrying on in anything less than 1,500 yards visibility when the future is unknown. Fly back into the better weather and ring up your destination aerodrome. The hills have, during the past fifteen years, been strewn with the wreckage of aeroplanes whose pilots said, "That will be all right, you'll find." It so rarely is. Disregarding those people who would, in the interests of general safety, deny blind-flying instruments to any pilot who has not at the same time got radio, I insist that a turn indicator (with the ability to use it) can be a very present help in trouble. If, while traversing a bad area, one runs at the same time into a heavy rainstorm or snowstorm, a turn indicator will allow you to fly with safety until the storm is over or until one has reached a clearer area where such a storm will not form a final disability. It is often a relief, in any case, to fly by instrument for a moment.



"Nowadays there is no need to fear the discomforts of cold weather..." An impression of the cabin interior of a Hornet Moth, a type which was used by the author of this article for two short business trips in the worst months of the year.

Weather or No

Nevertheless, the weather is not always as bad as it appears to be while one is approaching it. While making a round trip in December—again with a Hornet—I approached Salisbury Plain with trepidation. Over the Vale of the White Horse neither the Horse nor the Plain was visible. The clouds were at 1,000 ft., and it was sleeting. I was ready to turn back towards Witney at a moment's notice, yet found no necessity to do so, and five minutes later visibility was back to the six-mile order. The future *looked* impossible, but a careful investigation should never land one in sudden difficulties, and you may find that all is well.

Nearer Portsmouth I left the Hornet to itself for a few minutes while I opened another map section and measured off a new track. I felt some sharp little bumps, took no notice, and, when I looked up again, found that I was flying in cloud, with ice forming slowly on the wires and struts. It was a two-minute glide out of that cloud, so there must have been a useful updraught therein. Moral: Even if a machine *will* fly by itself, don't leave it alone too long when travelling immediately underneath an uneven cloud base.

Daylight Saving

On that short winter's day I spent a useful half-hour or more at each of three aerodromes, flew some 350 miles, "formated" (at half a mile) on a Short Empire boat (*Castor*, so far as I could tell at that distance and while Mr. Parker left me behind with his extra 70 m.p.h.), and formated accidentally on a squadron of Gauntlets from Hornchurch. These appeared suddenly out of the perennial smoke-gloom covering eastern London, and they tick-tocked downwards to give me the first "fix" I'd had since leaving the Thames at Gravesend. As I throttled back to turn away from them while they were making a circuit of an invisible Hornchurch I could distinctly hear, through my open window, the low mutter of the nine Pegasii. Only once previously had I heard another aeroplane while in the air—that was when the original Mew Gull overtook a machine in which I was a passenger during a race.

One final point about this winter flying business is, I think, worth stressing. The average owner and club pilot appears to think far too little about ground speeds. When the days are short it is essential to calculate, however roughly, a time of arrival at each aerodrome. A minute's manipulation of a C.D.C.—in the air, if necessary—will tell you whether there really is time to visit another aerodrome before heading homewards. On the particular trip just mentioned I was saved a lot of trouble and worry because a moment's work had shown me that, if I visited Lympne, I should have returned after lighting-up time. And Uncle Lamplugh may not be paying for that dusk-landing crack-up.

IN SEARCH OF GERMAN AND ITALIAN AVIATION—PART II

By CAPTAIN NORMAN MACMILLAN, M.C., A.F.C., A.F.R.Ae.S., F.R.S.A.

The REICHSLUFTFAHRTMINISTERIUM

Germany's Air Ministry —and a Note on D.L.H. Operating Methods

IN Berlin, at the intersection of Wilhelmstrasse and Leipzigerstrasse, stands a vast new building, the Reichsluftfahrtministerium. The nearest equivalent site in London would be about half-way down Whitehall.

The main block of this building runs parallel to Wilhelmstrasse. It rises to seven floors. The wings that run out in front and behind (those in front interconnected, those behind open) have five floors. There must be nearly three thousand rooms in the building. Floors bear the initial index number of a thousand, and room numbers reach into the five hundreds on each main floor. Thus; room No. 4,452 is room No. 452 of the fourth floor. That gives some indication of the size of this Air Ministry, the immediate chief of which is General Erhard Milch. Its Napoleonic dimensions suggest how important the Third Reich believes the Air Arm to be.

There, centralised under one roof, is the complete Air Ministry executive staff for the whole of Germany. That building, visualised as necessary for the expansion of the German Air Force, is the greatest Ministry building in Germany. It was built in less than a year, and has now been open rather longer.

The offices I visited were modern, well-warmed, comfortable and clean. Accommodation for typists as well as officers and officials was excellent. Members of the staff can obtain meals in the canteen. Prices are low. There is no distinction of rank. The same food is served to all—that is one of the principles of the new Germany, not only in the Air Ministry but in factories as well.

I was shown over this building in company with a German General and a party of officers who were paying a visit of inspection for the purpose of learning something of the new headquarters.

The 101 Chairs

The conducted tour our little party made took us to an ante-room and thence into the Council Chamber, where two long polished tables, with large chairs on each side, are joined at the far end of the room by a cross table. I counted the chairs—101 altogether, including the five at the upper table. A magnificent Gobelin tapestry depicting the victory of Charlemagne fills most of the wall space behind the five principal chairs. There are pictures of Hindenburg and Hitler. The decoration of the room is formal;

(Left) International convention at Tempelhof—Heinkel He.111, Junkers Ju.52, Danish Fokker, French Wibault, and others.

both direct and indirect lighting are used. I wondered what occasions would see that council chamber fully occupied.

We went down to the main entrance hall fronting the Wilhelmstrasse. This entrance is rarely used, being reserved for high formal occasions. The usual entrance is in the Leipzigerstrasse.

In the Wilhelmstrasse tall, ornamental iron railings demarcate an open paved courtyard formed between two of the wings. The entrance to the building is through glass-filled, metal-framed doors. One of the doors holds only one sheet of heavy glass of varying thickness which portrays, by the restraint of the light striking through it, the figure of Germany's symbolic Unknown Soldier.

To right and left of the marble-paved entrance hall are shrines. Their architecture is severe and plain, but impressive. The one on the right is dedicated to those who fell in the War, 1914-18, the other to those who fell in the Nazi Party's rise to power.

A broad flight of steps leads to stairways curving right and left, and at their head are the entrances to the great reception hall.

Architectural Magnificence

Doors of golden-coloured metal open to disclose a large, lofty hall floored with squares of black and lighter-coloured marble. The decoration of the walls is a *motif* of blue and gold. At one end, on a dais, stand three great chairs of state. At the opposite end is an organ with 8,000 pipes. All the lighting is indirect. The operation of the lighting switch simultaneously lowers the blinds of all the windows that face the Wilhelmstrasse. The lighting first appears in panels on the walls. Then the roof lighting begins. Dozens of recessed cupolas in the ceiling begin to glow blue and orange, then, swiftly brightening, they give the ceiling the effect of an ancient Moorish

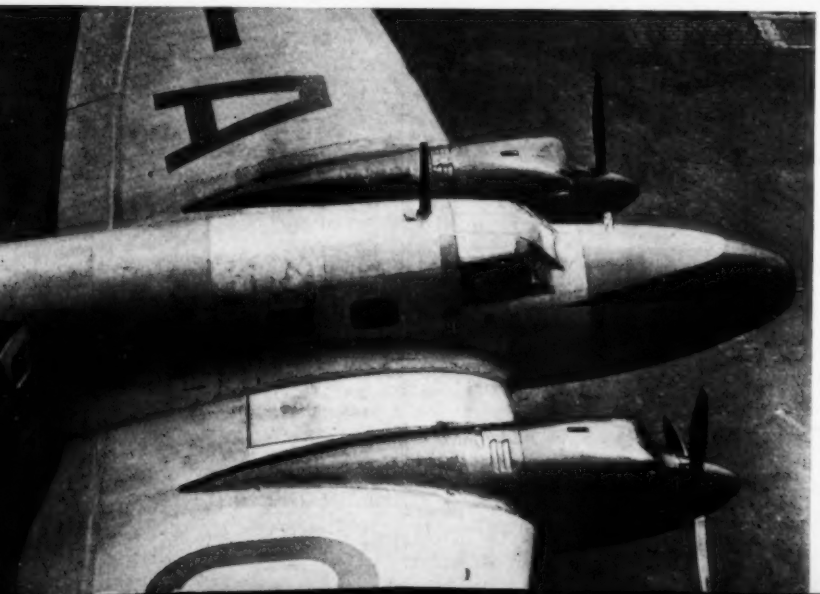
masterpiece brought to perfection by modern interior illumination. When the rheostat has completed its work the hall is a blaze of light and blended colour, as lavish a picture of modern architectural decoration as I have seen.

Behind the Air Ministry lie the gardens that belonged to the Houses of the old Prussian Diet. General Göring's Ministry (as Prime Minister of Prussia and of the four-year plan) is housed in the former Senate House. He lives alongside in the former palace of the Prime Minister of Prussia. On the other side of his palace stands the former House of Deputies of Prussia. This last is now the German Aero Club.

The assignment of the Prussian House of Deputies to the Aero Club von Deutschland by General Göring is almost breath-taking. It is as though the House of Commons were handed over to the Royal Air Force. Every officer in the German Air Force must belong to the Club. Subscriptions vary for those posted in or near Berlin and those on dis-

(Right) Germany understands how to combine gastronomy with aviation. The semi-open-air café at the Berlin airport.

(Below) A close-up of the ten-passenger He 111. The engines are B.M.W. vee-twelves of either 660 or 880 h.p.



tant stations. But all must be members. The club is palatial; there is no other word to describe its magnificent reception rooms, lounges, library, dining-room, staircases and gallery of portraits of the German air aces of the Great War.

No wonder that the whole block of buildings, which take up one complete square in the heart of Berlin—the Air Ministry, General Göring's Ministry, his palace, the Aero Club and their gardens—is known as *Göringstadt*—"Göring's Town."

Before I left the Reichsluftfahrtministerium a programme of visits was arranged from which I could see something of the new German effort in the air.

My first visit was to Tempelhof airport. This airport, already acknowledged to be one of the finest in Europe, is being enlarged. The present buildings will be demolished and new buildings erected nearer the city. Existing roadways and tramlines will disappear when the new airport is completed. Its final area will cover something like four square miles.

(Above) Looking, with its flaps down, less handsome than it actually is—the ten-passenger Ju.86, which has Jumo compression-ignition engines. D.L.H. now have a number in service.

At Tempelhof airport, under the guidance of an official of the Deutsch Luft Hansa company, I examined the interiors of the Junkers Ju.86 and Heinkel He.111 passenger aircraft. I found the cockpit layout of both machines extremely good, with ample comfort for the pilots, and all the controls placed to give the maximum facility for operation in flight. The pilots' view is very good. The line of both machines is extremely pleasing to the eye. Comfort for the ten passengers is much better than in the older Ju.52.

Then we left for Staaken on the west side of Berlin. There I saw the Deutsch Luft Hansa repair depôt in operation. The shops were dealing with repairs, overhaul and examination of Junkers Ju.52 and Ju.86 types, for all this work is dealt with directly by the transport company.

The engine shops were stripping and overhauling Jumo 205 heavy oil engines and B.M.W. Hornet air-cooled radials. Water-cooled B.M.W.s, I was told, were dealt with elsewhere.

Overhaul Periods

The times permitted by the Deutsch Luft Hansa between overhaul of engines and aircraft are of interest. Engines are now allowed to run for 750 hours before overhaul. Junkers Ju.52 airframes go up to 1,800 hours before complete overhaul, but inspections on the airframes are carried out every 300 hours.

I learned that no Ju.52s have yet reached the period for second overhaul, but that one of the aircraft in the service of the company has passed the figure of 2,500 hours. These figures are eloquent of the increasing reliability of aircraft material. At 2,500 hours the Ju.52, which cruises at an average 150 m.p.h., must have covered a total of 375,000 miles—no mean achievement for a vehicle of any description.

This leads one to believe that the time is rapidly

(Right) Signalling-out an He.111 with an indicator of the type used on railways. Note the official's armament.

Berlin Cathedral from the air. Owing to the central position of Tempelhof airport, the traveller by D.L.H. sees a good deal of the city—though this photograph was not taken on a regular route.

approaching when aircraft, owing to the peculiar conditions of their use, free from the severe buffeting that accompanies sea-borne transport, and from the unequal vibration to which road transport vehicles are subject, will prove to be the vehicles of greatest mileage life.

I learned, too, that Deutsch Luft Hansa pilots are paid on a bonus system which earns them an increase in pay if engines and airframes reach the full time allowed before overhaul. This appears a very sound method of paying bonus to transport pilots, for it serves to impress upon them at all times the need to take full care of the equipment entrusted to them, and to use it in such a way that it will give the longest period of service.

[*The next article in this series will describe a visit to the Henschel Aircraft Factory. In last week's article, incidentally, there occurred a slip which was probably obvious, but which nevertheless calls for correction. The cost of the London-Berlin journey should have read "4.3 pence per mile."*—ED.]

EXCELSIOR!

The Production-type Gladiator Scales the Heights

Flt. Lt. Summers aims high with one of the production Gloster Gladiators (825/840 h.p. Bristol Mercury IX). The machine, which now has an enclosed cockpit, is capable of 255 m.p.h. at 14,500 ft (*Flight* photograph.)

AT the BRITISH INDUSTRIES FAIR

Exhibits at Castle Bromwich and Olympia of Interest to the Aeronautical Industry

THE following notes, penned after a tour of the stands, will form a useful guide to the B.I.F. visitor on the look-out for points of aeronautical interest. Though it is impossible to deal at length with the exhibits—many products have been described in some detail in recent special numbers of "Flight"—the information given will serve as a general indication of the activities of some eighty firms, whose addresses and stand numbers are included. The Fair, both at Birmingham and in London, remains open until February 26.

Aero Engines, Ltd., Kingswood, Bristol (D.923).—Among the exhibits on this stand is the very neat and compact air-cooled flat-twin Sprite aero engine. A 1½-litre engine of about 45 h.p. is being developed by the firm.

Aeronautical Corporation of Great Britain, Ltd., Peterborough. (D.925, 824).—The Aeronca light monoplane with J.A.P. engine is attracting many visitors. A separate engine is also displayed, on which the detachable alloy head, large finned oil sump and Amal hot-spot air intake, via an exhaust pipe jacket, are noticeable points. Five sizes of Lang wooden airscrew are shown.

Accles and Pollock, Ltd., Oldbury, Birmingham (D.915 and 812).—By a clever grouping of the various tube and girder sections the show cases are made to resemble fine wrought-iron decorations. The firm specialise in manipulated tubes, particularly of small bore, and in stainless seamless tubing.

Accles and Shelvoke, Ltd., Aston, Birmingham, 6 (D.419 and 314).—Signal flares and pistols add variety to the small parts which are manufactured for the aircraft industry by this firm.

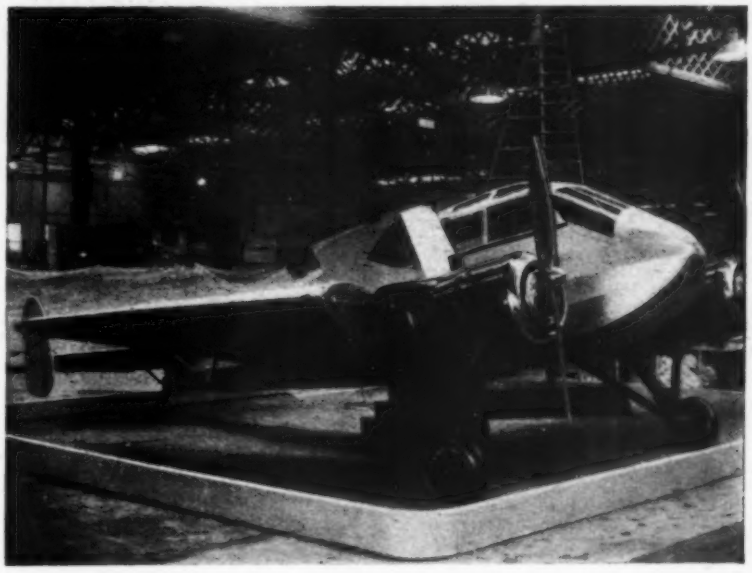
*Aerostyle, Ltd., Clerkenwell, London, E.C.*1 (B.908).—Light, compact and portable paint spraying equipment with internal combustion or electric power is made by this firm. In particular the very small "Aerolectric" unit is displayed. The design of certain models allows heavy covering coats of dope to be sprayed, considerably lessening the number of coats required.

Aladdin Industries, Ltd., Greenford, Middlesex (B.517).—The firm makes many types of incandescent paraffin lamps and paraffin heating stoves, among which is a special safety type suitable for aircraft hangar work.

Albion Drop Forgings Co., Ltd., Foleshill, Coventry (D.518).—In general with members of the Drop Forgings Association—a collective exhibit—this firm displays certain aircraft parts.

George Angus and Co., Ltd., Newcastle-upon-Tyne (D.305 and 204).—Special prominence is given to the firm's bearing oil seals and Gaco mouldings, but leather belting, brake lining and canvas hoses are also displayed.

Edgar Allen and Co., Ltd., Sheffield, 9 (D.831 and 730).—In particular among the variety of lathe tools are shown the "Stag" high-speed steel twist drills and the Allenite tungsten-carbide-tipped tools.



One of two complete aircraft at Castle Bromwich—the De Luxe Monospar shown by General Aircraft Ltd. Behind the machine is an uncovered wing. The other make exhibited is an Aeronca.

*Anglo-American Oil Co., Ltd., London, S.W.*1 (D.406).—All types of Esso and Essolube, together with greases and oils for hydraulic operation may be examined. An interesting point learned at the stand is that the Anglo-American Oil Co. is prospecting several large areas in this country for oil.

*Bakelite, Ltd., 68, Victoria Street, London, S.W.*1 (Cb.508).—A display illustrative of the applications of Bakelite is shown. A further note will be found under the London Section at the end of these notes.

*B.E.N. Patents, Ltd., Park Royal, London, N.W.*10. (B.825 and 736).—A good variety of large compressed-air pumps and storage tanks is displayed, together with complementary equipment used for spray-painting and other purposes.

Furnaces

Birmingham Electric Furnaces, Ltd., Erdington, Birmingham (Cb. 320).—A display of all kinds of furnaces for heat-treatment, melting and also for annealing and brazing occupies the stand.

Black and Decker, Ltd., Slough, Bucks (Cb.923).—Many types of electric tools are on view on the firm's stand, in particular portable drills and valve seat grinders.

Blackwell Oil Co., Aston, Birmingham (Cb.301), shows graphite oils and greases, engine and diesel oils, and also cutting and machine oils.

*British Aluminium Co., Ltd., King William Street, London, E.C.*4 (D.911 and 808).—A fine display covers many industries. A huge aluminium sphere of 2 metres diameter true to + or − ¼ in., together with Armstrong Siddeley Tiger VI engine cowling and outside baffles, airscrew blade pressings and a complete sectioned Pegasus complete the aircraft exhibit.

*British Insulated Cables, Ltd., Embankment, London, W.C.*2 (Cb.501 and 400).—Wires and cables are shown on the large general stand of the C.M.A. (Cable Makers' Association). Insulators of all sizes, enclosures, boxes and switches are also exhibited.

*British Oxygen Co., Ltd., Millbank, London, S.W.*1 (D.511 and 410 and D.324).—Large and small cutting and welding machines are demonstrated on one stand, and on the firm's other stand is metal-spraying plant which in the aircraft industry is used for aluminium, zinc, and lead application.

*British Thomson-Houston Co., Ltd., Aldwych, London, W.C.*2 (Cb.607 and 504).—Mazda lamps and certain new landing light bulbs form the aircraft exhibit of the B.T.H. Co., Ltd.

*Callenders Cable and Construction Co., Ltd., Victoria Embankment, London, E.C.*4 (Cb.501 and 400).—Callenders cables, wires and insulations are to be seen on the Cable Makers' Association stand.

Cedos Engineering Co., Northampton (D.843).—Many aircraft components are manufactured—mostly small machined parts requiring great accuracy and high quality.

*Cellactite and British Uralite, Ltd., High Holborn, London, W.C.*2 (Ca.821 and 720).—On the aerodrome side there are roof ventilators, roofing of metal with asbestos protection, air ducts which are imperishable, insulated wallboard com-

pound, and also fireproof sheet. In paint, enamels for cowlings, baffles and pipes are shown.

Cellon, Ltd., Kingston-on-Thames, Surrey (B.625).—A fine display of all colours and shades of Cellon finishes is made. Many mottled and multi-colour panels are also to be seen. Qualities and finishes of all kinds are available in most of the colours.

Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester (Cb.407).—Storage batteries, and also switching and emergency lighting apparatus, are exhibited by the company.

Cirrus Hermes Engineering Co., Ltd., Brough, E. Yorks (D.921).—The company's two famous aero engines, the Cirrus Major of 150 h.p., and the Cirrus Minor of 90 h.p., are shown on this stand. Both are four-cylinder, inverted, in-line, air-cooled engines.

Desoutter Brothers, Ltd., Hendon, London, N.W.9 (Cb.401).—Here is the usual fine display of drills and tools, some of which are being demonstrated. The show marks the first public appearance of the "Mighty Atom" drill announced in last week's *Flight*.

Elsan Manufacturing Co., 51, Clapham Road, London, S.W.9 (B.803, 714).—Chemical closets, among which are types intended for aircraft use, form this exhibit.

Electricars, Ltd., Lawley Street, Birmingham, 4 (Cb.911 and 810), show small factory trucks, etc., electrically propelled from storage batteries. It is from one of these vehicles that the Blackburn Electricar refuelling unit has been developed.

Endless Variety

Firth, Thos., and John Brown, Ltd., Sheffield (D.408).—A full display of cutters, reamers, files, drills, hacksaws, etc., all of Firth high-speed cutting steels, is to be seen.

Firth-Vickers Stainless Steels, Ltd., Sheffield (D.513, 412).—A wide selection of stainless steel aircraft components includes Napier and De Havilland exhaust manifolds, together with a variety of Supermarine parts such as sockets, spars and stays.

Firth-Vickers Stainless Steels, Ltd., Sheffield (D.727).—There is a varied display on two stands of stainless steel in all forms, showing its applications to art in the industries. Heat-resisting steel for furnace work may be examined.

Fletcher Miller, Ltd., Dukinfield, Manchester (D.309).—The firm are specialists in "Cooledge" machining oil, for which twenty important advantages are claimed, and also in "Swift" sulphurised straight cutting oil for tough metals needing a processed neat oil of great "lubricity."

Fox and Co., Ltd., Samuel, Stocksbridge, near Sheffield (D.713 and 612).—The company show a very varied collection of cold rolled steel strip, and of special and alloy steels. A 10 to 12 ft. 4-throw crankshaft forging is an amazing piece of work displayed, and a Cheetah IX engine, with other aero engine gears and air-cooled cylinders, show the work in this sphere.

General Aircraft, Ltd., Feltham, Middlesex (D.919 and 816).—The makers of the Monospar have long pursued a policy of interesting the ordinary business public in their aircraft, and the crowd round the De Luxe model (two Niagara IVs) on Monday again seemed to prove the wisdom of that policy. They went a step farther, too, by giving demonstrations in a Monospar from Castle Bromwich aerodrome, which adjoins the Fair. An uncovered Monospar wing, and the aerodrome smoke-trail apparatus which the company is handling, form other exhibits.

General Electric Co., Ltd., Kingsway, London, W.C.2 (Cb.617 and 514).—A huge 36 in. air-route beacon as supplied to Rangoon-Karachi and Australian Airways is outstanding; it gives over 1,000,000 candle power. The other exhibits include lighting for all purposes, switchgear and radio.

Gent and Co., Ltd., Faraday Works, Leicester (Cb. 606).—Electric impulse and synchronised clocks, electro-motor syrens, bells, telephones and relays, and indicators and recorders, many with application to aerodromes and factories, are the work of this company.

Henley's Telegraph Works Co., Ltd., Holborn Viaduct, London, E.C.1 (Cb.501 and 400).—A further member of the Cable Manufacturers' Association, this firm displays its products on the general stand.

The Hughes-Johnson Stampings, Ltd., Langley Green, Worcs. (D518).—Aircraft and engine drop forgings, also aluminium alloy work and heat treatment, are on view on the Drop Forgings Association stand.

I.C.I. Metals, Ltd., Witton, Birmingham, 6 (D.503 and 402).—A vast display building made up entirely of many tubes, strips, bars, etc., of all kinds of metals—brass, copper, cupro-nickel, phosphor-bronze, etc.—typifies the work of the company. Aluminium alloy has now been added to the I.C.I. non-ferrous range.

Imperial Chemical Industries, Ltd., Millbank, London, S.W.1 (D.405).—In particular is shown the cassel salt bath for hardening and heat treatment, apparatus for case hardening and treatment of high-speed steel, also electro-plating and rust proofing. All kinds of industrial furnaces are displayed, together with the products such as camshafts and gears carburised and "Rapideep" treated.

Incandescent Heat Co., Ltd., Cornwall Road, Smethwick (D. 327, 226 and Ca.709 and 608).—A representative display of the firm's variety of furnaces are to be seen on these stands. As readers of *Flight* know, I.H.C. furnaces are widely used in the aircraft manufacturing industry.

Johnson, Matthey and Co., Ltd., 78, Hatton Garden, London, E.C.1 (Cb. 312).—This firm, who specialise in precious and semi-precious metals (e.g., platinum for contact points) make a feature of their silver and other special solders.

London Aluminium Co., Ltd., Witton, Birmingham, 6 (A.511 and 408).—Though not shown on the stands, much aluminium sheet work is produced by the company for the aircraft industry.

Joseph Lucas, Ltd., Birmingham (Cb.601).—Rotax magnetos, dynamos, and motors are shown together with a sectioned drawing of a Short Empire Boat, indicating Rotax equipment (*e.g.*, batteries, flap-operating gear, wireless generator, main generator, main control panel, starter and magnetos). Portions of this equipment are also reproduced on the stand. A new small magneto and two new landing lights are to be seen.

London and Midland Steel Scaffolding Co., Ltd., Old Hill, Staffs. (D.526).—Ambitious indoor and outdoor display frameworks exemplify the "double-grip" steel scaffolding system.

M.C.L. and Repetition, Ltd., Langley, near Birmingham (D.506).—Makers of almost everything with a thread on it, M.C.L. display hundreds of such parts for all industries. The stand building itself is in the form of a huge nut and bolt. Electric lighting and starting equipment are also manufactured.

Moseley and Sons, Ltd., David, Ardwick, Manchester, 12 (D.719).—A big display of rubber hosing, flooring, mats, tubing and belts is to be seen, together with ebonite sheets and rods.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester (Cb. 806).—Battery vehicles, chassis and components are supplied by Metrovick, who also display a working continuous-torque foot-operated gear with clever interlocking devices, making it effectively foolproof.

National Benzole Co., Ltd., Buckingham Gate, London, S.W.1 (D.814).—Here is to be found the usual informative display of refining of benzole, as was seen at the recent Airports Exhibition.

New Process Welders, Ltd., Southall, Middlesex (Cb221).—Four pedal and pneumatic spot welders are shown, and also an automatic flash welder.

Philips Lamps, Ltd., 145, Charing Cross Road, London, W.C.2 (Cb.912).—Industrial exhibits of welding plants and examples of jobs done are shown, with several condensers and rectifiers.

From Books to Billets

Pinchin, Johnson and Co., Ltd., Broad Street, Birmingham (B.515 and 414).—Decorative and industrial enamels, lacquer and varnish finishes are on view; and also the unique "wet-on-wet" finishes for brush and spray work.

Sir Isaac Pitman and Sons, Ltd., and New Era Publishing Co., Ltd., Holborn, London, W.C.2 (B.901).—These publishers show a handsome collection of beautifully bound volumes on all technical subjects.

T. J. Priestman, Ltd., Leopold Street, Birmingham (D.607).—Great piles of billets of many alloys adorn the stand, while uninitiated onlookers wonder if "Ni Silver" on a card indicates that they are regarding a ton or so of solid silver. Other alloys include phosphor and aluminium bronze, gunmetal, non-corrosive silicon, aluminium and alloy, while examples of 98/99 per cent. pure aluminium are shown from production.

Reynolds Tube Co., Ltd., Tyseley, Birmingham (D.725 and 624).—A scale model Short Scion of about 10ft. span has Reynolds parts labelled: (1) High-tensile steel push rods; (2) steel tubes for oil and starter (3) Hiduminium bar engine and shock-absorber parts; (4) Magnuminium engine parts; (5) Ni/Cr axle tubes; (6) high-tensile shocker struts; (7) stainless steel exhaust pipe and manifold; (8) extruded floor beams; (9) chair frames in cabin of Magnuminium; (10) RR.56 roof forms and stringers; (11) extruded wing spars and ribs; (12) manganese steel tubing for the welded tail and fuselage units.

Several small engine forgings in RR.56 alloy are shown.

Rotax, Ltd.—See Lucas.

Rubery, Owen and Co., Ltd., Darlaston, South Staffs (D.903 and 802).—A comprehensive range of racks and steel storage bins, etc., and also asbestos buildings, are shown on this stand.

Rotherham and Sons, Ltd., Coventry (D.321).—All sorts of A.G.S. small parts and the Ki-Gass starting system may be seen, together with other aircraft products, on the stand of this company.

George Salter and Co., Ltd., West Bromwich (A.507 and 404).—This firm specialises in weighing machines and springs, of which a large variety are displayed. Many aircraft valve springs can also be picked out. Pressure gauges are also made and examples can be seen on the stand.

Silvertown Lubricants, Ltd., West Silvertown, London, E.16 (D.307).—A new and unusual demonstration is given on the stand of Silvertown, showing the "Hi-Duti" processing of oil which, by the addition of a pure hydro-carbon, is claimed to raise the film strength of a given oil up to thirty times its original value.

Simmonds Aerocessories, Ltd., Strand, London, W.C.2 (D.222).—An interesting working model shows the Simmonds remote push-pull control in several sizes, operating through sharp bends. Two new parts shown for the first time are developments of the elastic stop-nut, namely, strip nuts and a floating nut.

Smith-Clayton Forge, Ltd., Lincoln (D.518).—All types of drop forgings and some crankshaft stampings are displayed on the general Drop Forging Association stand.

Thomas Smith Stamping Works, Ltd., Coventry (D.518).—Many varied aircraft parts may be seen on the D.F.A. stand.

Standard Telephones and Cables, Ltd., North Woolwich, London (Cb.501 and 400).—Electric wires and cables for every purpose are shown on the Cable Manufacturers' Association stand.

Tecalemit, Ltd., Brentford, Middlesex (D.515 and 414).—The new unit-type greaser with self-rolling pipe is exhibited, and also a large two-stage air-compressor. The firm has an almost endless variety of lubricating equipment, fuel pumps, etc., applicable to aircraft work.

Herbert Terry and Sons, Ltd., Redditch (B.520).—Cases containing many hundreds of brightly coloured springs of every description adorn the stand of this firm. Small machined parts, pressings and spring-clips, brackets, plates, covers, are included in the collection of parts.

Turner's Asbestos Cement Co., Trafford Park, Manchester (Ca.401).—Large contracts have been obtained for asbestos cement products, which are becoming widely used. Drain pipes, ventilators, roofing, wall panels—all, it is claimed, are as strong as cast-iron, cheaper and need practically no painting. Asbestos-lined aluminium foil is made, which is suitable for aero insulation.

Vacuum Oil Co., Ltd., Westminster, London, S.W.1 (D.427).—The usual copious display of greases and oils for every purpose are to be seen on the stand of this company, whose name is a very familiar one in the flying world.

Venesta, Ltd., Queen Street Place, London, E.C.4 (B.811 and 722).—Examples of their metal-faced plywood panels, doors and bench tops are exhibited by this firm.

C. C. Wakefield and Co., Ltd., Cheapside, London, E.C.2 (D.507).—The new "All-in-one" high-pressure greasing unit is displayed with self-rolling disappearing pipes. There are also many other items of greasing and oiling equipment.

Wellworthy Piston Rings, Ltd., Suffolk Street, Birmingham (D.329).—An interesting showcase gives the ten machining operations on a piston ring. A very large display of rings both on and off the pistons is to be seen.

Wild-Barfield Electric Furnaces, Ltd., Holloway, London, N.7 (Cb.403 and 302).—All types of electric furnaces, including models suitable for enamelling, are on view. An interesting tiny rotating electric furnace is shown.

Zinc Alloy Rust-Proofing Co., Ltd., Shakespeare Street, Wolverhampton (B 914).—The firm is noted for its Sheradizing or zinc impregnation of iron articles. Grease-dipping removes traces of extra zinc powder and a fine oil black finish can be obtained by the Sherablak rust-proofing process over the Sheradizing.

OLYMPIA SECTION

Aerofilms, Ltd., Bush House, Aldwych, London, W.C. (C.439A).—An enlargement of an aerial photograph of a factory, with the buildings treated specially to indicate their extent, may be of great publicity value to a company. Aerofilms, Ltd., have produced large numbers of such pictures and specialise in all forms of aerial photography for commercial purposes. Examples of the results they obtain are shown.

Bakelite, Ltd., 66, Haymarket, London, S.W.1 (F.703).—The future of Bakelite materials for structural work, apart from their use for accessories, seems to be brightening rapidly. Bakelite, Ltd., are working in conjunction with Dr. De Bruyne and others, many of the results of their collaboration having been recorded in *Flight*. A chat on their stand gave the impression that big things will be happening before long in connection with airscrews. Incidentally, one gathered that Imperial Airways are using laminated Bakelite materials for cabin linings.

Ebonestos Insulators, Ltd., Excelsior Works, Rollins Street, London, S.E.15 (F.700).—Catalogued officially as manufacturers of mouldings in Bakelite, Mouldrite, Diakon and other synthetic resins and in Ebonestos plastic compositions, this company has been making a number of types of moulding in connection with aircraft work. A mounting for use with a downward identification lamp is exhibited.

Insulators, Ltd., Leopold Road, Angel Road, Edmonton, N.18 (F.845).—Mouldings for Williamson aircraft cameras are among the items moulded by this concern for the aircraft industry, in addition to instrument panels and cases. A large amount of Air Ministry work is in hand.

Kent Mouldings, Cray Works, Sidcup, Kent (G.949).—Several items moulded specially for aircraft use are among this company's products.

Mouldrite, Ltd., Thames House, Millbank, London, S.W.1 (F.705).—"Perspex" is becoming a name to conjure with in the aircraft field and is already used for windscreens and windows in some of the most up-to-date military types, including the Blenheim, Wellington and Hampden medium bombers. It seems, in fact, that there is hardly a single manufacturer who is not specifying this material for some component or another. One of its most recent applications is to Meyrowitz goggles. On Stand F.705 one may look endwise through twenty-eight solid inches of Perspex and note the clarity of objects at the other end It is interesting to note that manipulation of Perspex is carried out by Plastilume Products, of Hanwell, London, W.7.

Rozalex, Ltd., Yorkshire House, 45, Cross Street, Manchester, 2 (H.1041).—Occupational dermatoses, or abnormal skin conditions arising from association with certain industrial processes and commodities results, it has been claimed, in the loss of more days' work than any other complaint. They may result not only from such associations but from the method of cleaning the hands and arms after work. A proven safeguard is Rozalex, which is applied before work (specially designed dispensers are available) and removed subsequently by ordinary soap and water. Further details appear in a paragraph on page 175.

Forthcoming Events

February 18. R.Ae.S. Lecture*: "Possible Layouts for Air-cooled Engines," by Mr. A. H. R. Fedden.
February 18. Civil Aviation Service Corps: Dance, First Avenue Hotel, London.
February 18. R.Ae.S. (Coventry Branch) Lecture: "Silencing Aircraft," by A. H. Davis. Armstrong Canteen, 8.15 p.m.
February 19. Croydon Airport Annual Dinner and Dance.
February 20. Rugby: R.A.F. v. Royal Navy, Twickenham.
February 22-26. Egyptian R.Ae.C.: Oasis Meeting.
February 25. R.Ae.S. Lecture*: "Power Measurements in the Air," by Mr. N. S. Muir.
February 25. Norfolk and Norwich Aero Club: Tenth Anniversary Dinner.
February 26. Brooklands and Associated Clubs: Dinner and Dance, May Fair Hotel, London.
February 26. Hampshire Aeroplane Club: Annual Dinner and Dance, South-Western Hotel, Southampton.
March 11. R.Ae.S. Lecture*: "Airscrew Blade Vibration," by Major B. C. Carter.
March 12. Leicestershire Aero Club: Annual Ball, Grand Hotel, Leicester.
March 12. Cinque Ports Flying Club: Annual Dinner and Dance, Grand Hotel, Folkestone.
March 18. R.Ae.S. (Coventry Branch) Lecture: "Navigation," by Sqn.-Ldr. Godsave. Armstrong Siddeley Canteen, 8.15 p.m.
April 3. Rugby: R.A.F. v. Army, Twickenham.
April 8. R.Ae.S. Lecture*: "Control Problems," by Mr. A. G. Pugsley.
April 15. R.Ae.S. (Coventry Branch) Lecture: "Production and Inspection Methods Applied to Screw Threads," by S. J. Harley. Armstrong Siddeley Canteen, 8.15 p.m.
April 22. R.Ae.S. Lecture*: "Power Plant Trends," by Mr. G. J. Mead.

* These lectures take place at the Royal Society of Arts, 18, John St., London, W.C.2, at 6.30 p.m. Admission is by ticket obtainable through a member.

THE LION and the LAMB

Aircraft Industry Entertained by the A.I.D. : "Family" Approaching the 1,000 Mark

NEW definitions of the meaning of the letters "A.I.D." were suggested at the twelfth annual dinner given by the A.I.D. Technical Staff Association to representatives of the British aircraft industry at Grosvenor House, London, last Friday. The Secretary of State for Air, Viscount Swinton, started the ball rolling by suggesting "Anything Inferior Detected," and Col. Outram went one better with "Absolutely Immune from Defect." These definitions are certainly an improvement on the one suggested by a cynic some years ago, who thought the letters stood for "Always In Doubt." That the new meanings suggested have in them a good deal of truth was proved by a statement made by Sir Robert McLean, who explained that some time ago it became necessary for the Society of British Aircraft Constructors to criticise certain departments of the Air Ministry, but that no one had any faults to find with the A.I.D.

Some indication of the way in which the R.A.F. expansion affects the aircraft industry is afforded by the fact that the party numbered close upon 1,000. The transfer to Grosvenor House must be counted an unqualified success, not merely because there was space for everyone without crowding and without the need for "overflows" into dreary spaces under galleries, but also on account of the excellent view of the stage from every table in the room. Thus every member of the gathering could see and hear the speakers, and enjoy the entertainment within the limits imposed by a large percentage of talking "shop" during the various "turns." Mr. Jack Jarvis was, as usual, in charge of the organisation, which is merely another way of saying that this was perfect, with the time-table followed to the minute.

Viscount Swinton, Secretary of State for Air, was the first speaker; in proposing the toast of the A.I.D. he stressed the fact that the Aeronautical Inspection Directorate and the aircraft industry worked together so well because they understood one another's problems. There had been criticism of the Air Ministry for ordering certain aircraft types which were not entirely modern. In a progressive science it was not possible to introduce everything new into every new type. They had to get on with production, and once a type was approved, it needed an Air Council ruling to get alterations made.

Of the quality of British aviation products Lord Swinton said he listened most of all to the opinions of foreign buyers. They could go to any aircraft manufacturing nation for their products, and when they thought it worth while to pay fairly high prices for British aircraft, and then were willing to wait for deliveries, he thought it was a good testimony to the qualities of our products. The urgent need of the moment was production of aircraft and engines.

Lt.-Col. H. W. S. Outram, Director of Aeronautical Inspection, after thanking his inspectors and the rank and file of the A.I.D. for doing their work while training the newcomers, pointed out that now they were facing the real difficulty. Hitherto they had worked with old friends, but now they would have to inspect the work of firms in the shadow industry. What could be termed the second A.I.D., the Approved Inspection Department, had now grown to a strength of close upon 1,000. At one aero engine works alone there were 500 of the approved inspectors.

Proposing the toast of the visitors, Mr. A. McIsaac, expressed his appreciation of the fact that in spite of the gathering being about five times as large as that of the first of those dinners, the fine spirit of informality had been retained. The dinner provided a welcome reunion for many who were separated during the rest of the year.

A "First Appearance"

Col. Sir Donald Banks, Secretary of the Air Ministry, was making his first appearance at an A.I.D., T.S.A. annual dinner, and at once "established" himself by striking just the right note. He felt, he said, that the A.I.D. was always on the job and that he had been put up for inspection that evening. He had been equally curious to inspect the A.I.D. and in looking around him he saw no evidence of anything abnormal. He came to the conclusion that the A.I.D. worked on a sort of "knock-knock" principle. If anything was found hollow it was thrown out.

Sir Robert McLean, chairman of Vickers (Aviation), Ltd., and of the Society of British Aircraft Constructors, began with a complaint against the organisation of the A.I.D., T.S.A. dinners. It seemed, he said, that he was fated to follow after the best speakers. Last year he followed Stainless Stephen and this year he was following Sir Donald Banks! He recalled that had it not been for the initiative shown by British aircraft constructors a couple of years ago in producing original types, the present expansion would have been impossible. He pleaded for guidance from the Air Ministry and told Lord Swinton that if he could get from the Air Ministry a guide to what would be required in the future, he would have done something of very great value.

A Hardy Annual

The Air Annual of the British Empire, 1937. Sir Isaac Pitman and Sons, Ltd., Parker Street, Kingsway, London, W.C.2. 21s. net.

AS handsome as ever in appearance, although slimmer in form due to the separation from the main work of the French and Spanish supplements, this year's *Air Annual* has been delayed somewhat through the editor's desire to include descriptions of certain recent aircraft types. The foreign supplements can be obtained on application.

The main body of the annual is devoted, as usual, to descriptions of current types of aircraft and aero engines and to a review of materials, airways and airports, aerial photography, and certain items of equipment. The customary reviews of technical developments and Service and civil aviation are included and give a lucid explanation of the present position of British aviation.

Mr. S. Scott-Hall's article on recent aircraft developments makes the point that a visitor to last year's R.A.F. or S.B.A.C. Display who had been told beforehand that he might expect speed but not manœuvrability from the new types might, as Mr. Scott-Hall puts it, have been not a little perplexed at what he saw, for the degree of manœuvrability attained was of an extremely high order.

The writer goes on to say that it is evident that the limiting factor on the manœuvrability of the new aircraft is the ability of the pilot to withstand accelerations which, even two years ago, would have been regarded as intolerable except for racing or very exceptional aerobatics.

Graphs and tables are plentiful, and the excellent quality of the paper has permitted some really beautiful photographic reproductions.

Full Power—Cold Oil

PARTICULARLY in the case of military aircraft, which are often called upon to leave the ground at short notice, the problem of warming-up to secure efficient functioning of the engine lubrication system is an acute one.

The Bristol Company during five years development, have evolved for their engines what they term a "high initial oil pressure system." It is stated that by its aid Bristol engines can develop full power with absolute safety as soon as they are started.

It is used during the overload tests which are a normal feature of Bristol development, and is used in the Pegasus Xc engines of the Empire Flying Boats, in which warming-up at moorings is sometimes a very difficult process.

Flight testing was performed in a Bristol Bulldog during the winter months. Before each take-off the oil tank was replenished with refrigerated oil at a temperature considerably below 0°C. The throttle was opened wide as soon as the cold engine was started and a ful power climb to 10,000 feet (3,050 metres) was, it is stated, maintained with perfect safety. The average time taken by the machine to leave the ground after the engine had been started was about 20 seconds. This test was performed twice a day for several weeks.

The diagram on page 175 shows the operation of the system. When an engine is running under normal load conditions oil enters the engine from the pressure pump "A" through the tail end of the crankshaft. The main relief valve

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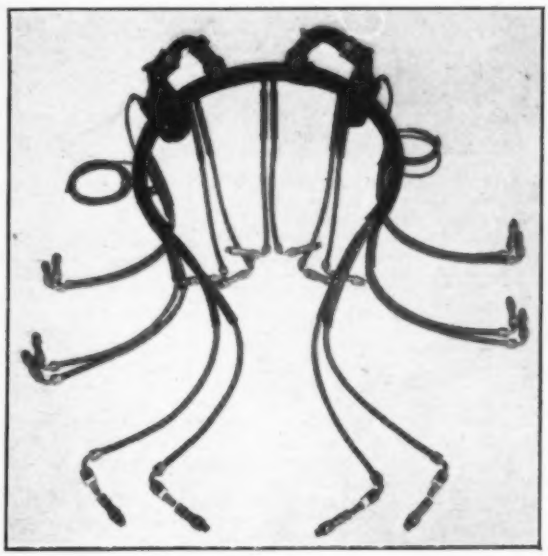

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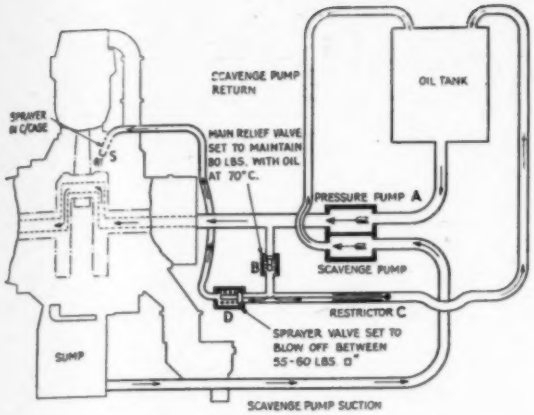
SCAVENGE PUMP RETURN
OIL TANK
SPRAYER IN CRANKCASE
MAIN RELIEF VALVE SET TO MAINTAIN 80 LBS. WITH OIL AT 70°C.
PRESSURE PUMP A
SCAVENGE PUMP
RESTRICTOR C
SPRAYER VALVE SET TO BLOW OFF BETWEEN 55-60 LBS.
SUMP
SCAVENGE PUMP SUCTION

The layout of the Bristol "cold start" system.

"B" controls the oil pressure at a minimum of 80 lb/sq. in. (5.62 kilos/cm²). The by-passed oil from this valve is returned under its own pressure to the oil tank.

A suitable size restrictor "C" is fitted between the main relief valve "B" and the return pipe-line to the oil tank. This restrictor is constructed so that it will allow normal circulation of by-passed oil at a reasonable pressure. When the oil is cold, however, the restrictor will create a higher pressure due to the increase in viscosity of the cold oil and the greater quantity circulated through the by-pass valve "B." Moreover, the oil pressure in the crankshaft will also be increased to the sum of the pressures required to open the main relief valve "B" and the sprayer valve "D," which controls a sprayer "S" fitted in the top of the crankcase; an auxiliary supply of oil is thus squirted directly to the crankpin bearing as long as the oil is cold. Immediately the oil becomes warm, the viscosity and quantity of oil by-passed decreases; the pressure created by the restrictor is automatically reduced, and the sprayer valve shuts, cutting off the auxiliary supply.

In actual practice the sprayer valve and restrictor are incorporated in the form of a sleeve valve, which enables the quantity of oil circulated through the sprayer to be governed, as well as the temperature at which the sprayer is automatically cut out.

The system is entirely automatic in operation and requires no attention. It is included unobtrusively with the various engine components concerned and, except for an additional external pipe-line to the oil tank, adds practically nothing to the bulk or weight of the engine.

It is a standard feature of all 1937 Pegasus and Mercury production engines.

The R.I.B.A. Airports Exhibition

TO-MORROW, Friday, February 19, Lord Swinton is to open the Airports and Airways Exhibition organised by the Royal Institute of British Architects, and to be held at the Institute's headquarters at Portland Place, London, W. The exhibition is being held at the request of a number of leading municipalities, and after its London showing—which will last until March 4, it will tour Bristol (April), Sheffield (May), Liverpool (July), Birmingham (August), Manchester (October), Derby (March, 1938), Wolverhampton (May, 1938), and other towns.

The exhibition will be divided into four sections: —

(1) Airport siting, planning, design and equipment;
(2) Models and photographs of modern civil aircraft;
(3) Map-making and survey;
(4) Aerial views of cities.

A collection of models and photographs—said to be one of the most remarkable of its kind ever gathered together—will illustrate modern tendencies in airport planning both in this country and abroad.

Admission to the exhibition is free, and the hours of opening are 10 a.m. to 8 p.m. (Saturdays, 10-5).

A rather unique "advance view" of some of the exhibits was granted to television enthusiasts last Monday, when Mr. Nigel Norman gave a first-rate talk from the Alexandra Palace, illustrating his points with models. Particularly entertaining was his reference to airliner passengers of not so very many years ago: "Clinging to wicker chairs and peering through oil-stained celluloid windows, while they shouted at one another 'how wonderful flying was'."

But we do hope Mr. Norman was not the extremely dangerous pilot of the D.H.86 (was it?) which, at the end of a piece of cotton, made a 2 m.p.h. approach over the Gatwick model.

New Research Appointments

BRITISH aviation circles will have learned with interest and satisfaction that the Air Minister has appointed Mr. D. R. Pye, M.A., Sc.D., M.I.Mech.E., F.R.Ae.S., to be Director of Scientific Research on the retirement of Mr. H. E. Wimperis, C.B., C.B.E., M.A., F.R.Ae.S., and Mr. W. S. Farren, M.B.E., M.A., F.R.Ae.S., to be Deputy Director of Scientific Research in succession to Mr. Pye. Mr. Pye's appointment will take effect from March 1 and Mr. Farren's from April 1, 1937.

Mr. Wimperis is, as recorded in *Flight* some weeks ago, retiring at the end of this month, and is then going to Australia to advise its Government on research problems. The appointment of Mr. Pye to succeed him will be welcomed by the British aircraft world. As Deputy Director since 1925 Mr. Pye has won the esteem of technicians for his thorough grasp of aeronautical problems, theoretical no less than practical (he served in the R.F.C. and R.A.F. during the war). Mr. Farren also is well and favourably known to everyone in British aviation, having lectured at Cambridge and South Kensington for many years and being a member of the Aeronautical Research Committee, on many of the sub-committees of which he serves. Mr. Farren was a pilot during the war (at the R.A.E.) and was later connected with the technical department of Armstrong Whitworth Aircraft.

Hand Protection for Works Operatives

THERE are a number of processes in the aircraft industry which are capable of proving harmful to the hands of operatives, and such damage may easily lead to those skin affections which come under the heading of "occupational dermatitis."

That this danger is averted by the use of "Rosalex" hand-cleaner is one of the chief claims of the makers, Rosalex, Ltd., Yorkshire House, Cross Street, Manchester. Rubbed into the hands before work is started, Rosalex forms a film which prevents the absorption of dirt and harmful substances. Afterwards, washing with soap and water brings the dirt away with remarkable ease.

The makers state that an extract from an Air Ministry official report on "Rosalex" is as follows:—

"Practical tests were carried out by coating the fingers with a film of the material and dipping in a dope. After allowing the dope to remain on the fingers for about ten minutes, attempts were made to wash off with water. Similar tests were carried out with paint and mineral oils. In all cases with 'Rosalex' it was found possible to remove the dope, paint, and oil easily with soap and water."

To judge also from testimonials by various industrial concerns, the makers' claims are well justified, and our own fairly lengthy experience with "Rosalex" as a motorists' hand-cleaner further bears this out.

Prices for bulk supplies run from 10s. (7 lb.) to 110s. (112 lb.). Dispenser units are also sold. It is obtainable, too, for home use in 6d. and 1s. tubes.

"Macamit" Aprons and Approach Roads

DURING the past few years great advances have been made with the manufacture and use of tar and bitumen macadam for roads, and the subject is of particular interest for airports, not only as regards roads but also for aprons.

Considerable interest attaches in this connection to the macadam product "Macamit" of the Mountsorrel Tarred Macadam Co., Ltd., of Welford Place, Leicester. This is now being extensively used for constructing new roads, while since 1933 another outstanding advance is its use on the "carpet" principle, that is, a layer about ¾in. thick placed on the top of any existing surface.

At Leicester City Airport, the whole of the aprons are surfaced with "Macamit," while the company has also carried out important work at Desford Aerodrome, Leicestershire.

"Macamit" is composed of screened Mountsorrel granite chippings of special sizes, carefully blended to prevent voids, mixed with blended asphaltic bitumens. Granite of this quality is well known to possess a high resistance to crushing, about 15 tons/sq. in., which explains the nature of the main advantages of the material, i.e., dustlessness and non-skid properties.

The material is laid in the simplest fashion with great rapidity, being merely sent by rail or road, transported to the site, spread over, and rolled with an 8-10 ton roller.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS — AIR MINISTRY ANNOUNCEMENTS

THE PUNY WORKS OF MAN : The Baffin torpedo-bombers of No. 811 Squadron from H.M.S. *Furious*, look down on the Forth Bridge, the battleship *Nelson*, and the carrier *Courageous*.

CHANGE IN HIGHER COMMAND

The Air Ministry announces the following appointment:—

Air Comdre. Charles Dempster Breese, C.B., A.F.C., to be Air Officer Commanding No. 17 (Training) Group from a date in March, 1937.

NO. 8 FLYING TRAINING SCHOOL

The undermentioned officers and airmen pilots have been awarded special assessments on completion of a course of flying training at No. 8 Flying Training School, Montrose:—

Special Distinction

A/P. K. McL. Gillies.

Distinguished Pass

A/P.s P. G. Jameson, G. C. O. Key, J. F. Newman, and L. G. Schwab, Acting Sgts. Langton, R. T., Ollason, W. C., and Smythe, T. L. S.

PERMANENT COMMISSIONS FOR WARRANT OFFICERS

The undermentioned warrant officers have been granted permanent commissions:—

Commissioned Signals Officer

W. M. E. Cannock and T. Wilson.

Commissioned Engineer Officer

R. Best, E. T. McKeown, and S. W. Blight.

Equipment Branch

The undermentioned warrant officers have been granted permanent commissions in the equipment branch:—

J. E. Watson, M.B.E., W. Dalton, H. F. Levell, E. J. Stephens, C. Darke, R. W. Ware, J. E. Hatfield, J. W. Lamb, W. R. McCleery, A.F.M., and H. P. Simpson, M.M., A.F.M.

CENTRAL FLYING SCHOOL

The undermentioned officers and airmen have been recategorised as under:—

A.2 to A.1

Flt. Lts. R. C. Mead and A. C. Mitchell, Sgt. Kirkland, C.

B to A.2

Flt. Lts. F. S. Gardner, M. B. Hamilton, J. Grandy, G. N. Snarey, W. J. Hickey, and F. W. C. Shute, Sgts. Cordon, W., Masefield, E. B. G., Bannister, S. W., Gledhill, F. H., and Upton, D. A.

IMPERIAL DEFENCE COLLEGE

The following officers have completed satisfactorily a course at the Imperial Defence College, which terminated in December, 1936, and are entitled to the letters "*i.d.c.*" after their names in the Air Force List: Group Capt. R. Graham, D.S.O., D.S.C., D.F.C., *p.s.a.*, Wing Cdrs. B. J. Silly, M.C., D.F.C., *p.s.a.*, R. S. Sorley, O.B.E., D.S.C., D.F.C., *p.s.a.*, J. L. Vachell, M.C., *p.s.a.*, and H. A. Whistler, D.S.O., D.F.C., *p.s.a.*

COURSES IN FOREIGN LANGUAGES

The undermentioned officers have been provisionally selected to undergo training in foreign languages during 1938-39:—

F/O. A. C. P. Carver in Arabic or Kurdish, at Iraq, for one year, or until preliminary examination is passed, whichever is shorter.

F/O. F. G. Frow in Chinese, at the School of Oriental Studies, London, for six months.

F/O. P. L. Donkin in Russian, at the School of Slavonic Studies, London, for three months.

F/O. J. N. Tomes in Japanese, at the School of Oriental Studies, London, for six months.

APPOINTMENT OF AIR ATTACHÉ

Wing Commander Thomas Walker Elmhirst, A.F.C., has been selected as Air Attaché, Angora, and will take up his duties shortly. He is the first Air Attaché to be accredited to the Turkish capital.

SCHOOL OF AIR NAVIGATION

The undermentioned officers, having successfully completed the Specialist Navigation Course at the School of Air Navigation, Manston, which terminated on November 7, 1936, are granted the symbol "N":—

Flt. Lts. L. F. Brown, W. E. Oulton, J. J. Owen, G. J. L. Read, G. I. L. Saye, A.F.C., and W. P. Welch. The undermentioned officers also successfully completed the course: Flt. Lts. J. G. Bryans (R.C.A.F.), and R. C. Hiemstra (S.A.A.F.).

No. 40 SQUADRON

No. 40 Squadron will celebrate the 21st anniversary of its formation on February 25, on which date it is proposed to hold a dinner and dance for all ranks in the Station Institute, R.A.F. Station, Abingdon, Berks. The Officer Commanding No. 40 Squadron would be glad to hear from any Officers, N.C.O.s or Airmen who served in the Squadron, and who wish to attend the dinner and dance, the cost of which is 5s. (exclusive of wines), before February 15.

TRANSFER OF OFFICERS TO THE RESERVE

The undermentioned short service, medium service and non-permanent officers should note that they become due in June and July next for transfer to the reserve, or (where indicated) for relinquishment of commission, on completing their period of service on the active list:—

General Duties Branch

Flt. Lts. Montagu Victor Murray Clube, Francis Guy Mason, Ronald William Macdonald Clark, and Edward Charles Smith-Ross.

Medical Branch

Flt. Lt. Joseph Francis Ziegler, M.B., B.S.

Dental Branch

Flt. Lt. David Ivan Malcomson, L.D.S.

Chaplains Branch

The Revd. Richard Rees. (To relinquish commission, not liable for reserve service.)

Statements from the Revd. R. Rees and Flt. Lt. Malcomson indicating whether or not they desire to be considered for an extension of service to six and ten years on the active list respectively, are to be forwarded forthwith.

No. 6 (AUXILIARY) GROUP

In the issue for 1936 of the magazine of No. 603 (City of Edinburgh) (Bomber) Squadron, Air Comdre. J. C. Quinnell, D.F.C., reviews the recent changes in the Auxiliary Air Force. Early in 1935 it consisted of eight squadrons; there are now fifteen. The increase is due to raising three new squadrons and converting four Special Reserve squadrons. Four new A.A.F. squadrons have still to be raised, and the Ulster squadron may be converted from S.R. to A.A.F. Within the next few months there will be A.A.F. army co-operation squadrons, which will be provided either by forming them direct or by converting existing squadrons from bomber to A.C. duties. In case of conversion, new squadrons will be raised to take the place of those converted. The City of Edinburgh Squadron is under consideration for such a conversion, but new factors are arising which may prevent it from taking place.

OFFICERS AND AIRMEN OF THE JEWISH FAITH

So far as the exigencies of the service permit, leave should be granted to officers and airmen of the Jewish Faith stationed at home who may desire to observe the undermentioned holy days during the current year:—(i) Feast of the Passover, March 27 to April 3; (ii) Feast of Pentecost, May 16 and 17; (iii) New Year, September 6 and 7; (iv) Day of Atonement, September 15; (v) Feast of Tabernacles, September 20 and 21. Leave may also be granted to officers and airmen serving abroad at stations where facilities exist for observing these holy days. The personnel concerned should be excused duty as from sunset on the previous day. The leave granted under this order will count as part of the ordinary annual leave.

ANOTHER NEW SQUADRON

No. 63 (Bomber) Squadron formed at Andover on February 15. The unit will be equipped with medium bomber aircraft and placed in the Bomber Command in No. 2 (Bomber) Group. The unit will move to Upwood on March 4.

FROM BOMBERS TO FIGHTERS

No. 608 (North Riding) (Bomber) Squadron has been renamed No. 608 (North Riding) (Fighter) Squadron with effect from January 16.

SHORT SERVICE OFFICERS

The Air Council have decided that extensions of the active list period of the commissions of short service officers entered for four years may be granted to a limited number of short service officers who volunteer and are recommended therefor on completion of eighteen months' service. The service of officers so selected will be extended to complete six years on the active list (including the time spent at a civil school) followed by six years on the reserve. The gratuity for each additional year on the active list will be £100.

COURSES OF INSTRUCTION AT MANUFACTURERS' WORKS

Courses of instruction on aircraft and engines will be arranged at manufacturers' works for a strictly limited number of R.A.F. supervisory personnel. No course will exceed twelve working days and will normally commence on a Monday and terminate on a Friday. The number of personnel sent forward from each unit should be kept to a minimum.

OLD COMRADES ASSOCIATION, R.N. SEAPLANE BASE, PORT SAID

The fifteenth annual reunion of the Old Comrades Association, R.N. Seaplane Base, Port Said, will be held in London on Saturday, February 20. Particulars may be obtained from Mr. Norman M. Williams, 16, Shrewsbury Avenue, East Sheen, S.W.14.

AIRMAN PILOTS

Airmen who are accepted for training as pilots after the date of this order and are subsequently selected for re-engagement will be required to keep in flying practice until they attain the age of 42 or are promoted to warrant rank, whichever occurs first. It will, however, be within the discretion of an air or other officer commanding, on the recommendation of a C.O., to decide at any time that an airman shall no longer be retained in flying practice if evidence that he has ceased to be an efficient pilot is forthcoming. While retained in practice, airmen will be liable for pilot service in emergency.

FLYING ACCIDENTS

The Air Ministry regrets to announce that P/O. Robert Douglas Blair (Second pilot) is missing and is presumed to have lost his life as the result of an accident which occurred at Seletar on February 2, to an aircraft of No. 205 (Flying Boat) Squadron, Seletar, Singapore. The first pilot of the aircraft, Sqn. Ldr. Albert Wentworth Bates, and the following members of the crew were slightly injured: L.A/C. William Trevor Davies, A/C.1 Joe Lee, A/C.1 Leonard Frank Wilkins, and A/C.1 Alexander Thomas Edward Daniells.

The Air Ministry regrets to announce that Lieutenant Gerald Arthur Vardon, Royal Navy, Flying Officer, Royal Air Force, and No. P/JX 129984 Telegraphist Bert Overal, Royal Navy, lost their lives as the result of a collision in the air which occurred off Alexandria on February 5, 1937, between two aircraft of No. 825 (Fleet Spotter Reconnaissance) Squadron, embarked of H.M.S. *Glorious*.

Lieutenant Vardon and Telegraphist Overal were the pilot and passenger of one aircraft. The occupants of the second aircraft are safe and uninjured.

Also that P/O. Michael Philip Forte and L.A/C. F. W. East lost their lives in an accident which occurred at Waddington on February 6 to an aircraft of No. 503 (County of Lincoln) (Bomber) Squadron. P/O. Forte was the pilot of the aircraft and L.A/C. East the passenger.

Also that A.P/O. Arthur Simpson lost his life in an accident which occurred at Minera Mine, near Wrexham, on February 12, to an aircraft of No. 5 Flying Training School, Sealand, Chester. A.P/O. Simpson was the pilot and sole occupant of the aircraft.

ROYAL AIR FORCE GAZETTE

London Gazette, February 9, 1937

General Duties Branch

Flt. Lt. T. F. U. Lang is granted a permanent commission in that rank (February 6).

The following are granted permanent commissions as Pilot Officers with effect from February 1 and with seniority of the dates stated:—N. M. Bayliss (May 1, 1935); A. G. H. Bell, G. P. Harger, A. T. Irvine (November 1, 1935).

The following are granted short service commissions as Acting Pilot Officers on probation with effect from and with seniority of the dates stated:—M. R. Atkinson, P. C. S. Bagley, C. A. Baskett, R. C. Beaman, H. W. Beggs, R. L. C. Branson, J. R. Brown, P. H. Buckley, R. H. Bullard-Davies, T. M. Bulloch, B. F. Burbridge, E. J. Clarke, T. A. Darling, F. L. H. Eddison, D. I. Fairbairn,

A. E. R. Ferris, J. J. K. Fleetwood, J. W. Graafstra, A. G. Gillespie, J. R. Grice, D. S. Hoare, W. D. Hodgkinson, G. W. Jones, N. K. Loyd, H. A. Olivier, R. J. O. O'Neill-Roe, R. J. Payne, W. N. Perioli, P. C. Pickard, D. F. Rixson, D. C. Ross, R. H. Sherlock, A. H. Simmonds, R. G. Temple-Harris, R. A. Thomson, H. O. Thwaite, J. D. Tillott, J. Tilsley, E. W. Tremlett, C. F. L. Tulloch, R. W. Turner, L. T. Wallis, J. A. C. White (January 25); L. V. E. Atkinson, J. W. Baird, J. R. Bendell, G. G. Bowker, D. H. Bryan-Gower, J. B. Coward, M. D. Day, O. R. Donaldson, P. E. Dundee, I. U. McR. Gallaway, G. P. Hewson, T. L. Howell, H. M. S. Lambert, R. Langebear, R. J. McConnell, W. A. Pattison, L. W. Skey, C. A. C. Stone, A. W. G. Stuart, E. W. Tate, C. P. Wright (January 28); A. W. Jackson (January 30).

The following Acting Pilot Officers on probation are confirmed in their appointments and graded as Pilot Officers:—I. M. Brodie, F. E. Burton, D. L. Davies, J. M. Downton, D. Ford, C. L. Olsson, D. Perry, P. R. Woodward (January 6); S. R. Gibbs (January 27); H. P. Blatchford, S. McC. Boal, A. M. Brown, J. A. Crockett, H. M. Crump, J. M. Griffith-Jones, E. C. Inglefield, B. MacCallum, D. F. Spotswood (February 3).

F/O. C. G. Lott is promoted to the rank of Flight Lieutenant with effect from January 10, and with seniority of October 9, 1936.

The following Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—D. C. Torrens (January 3); W. I. Hammond (January 8); R. I. Jones (January 27).

Air Comdre. W. F. MacN. Foster, C.B., C.B.E., D.S.O., D.F.C., is placed on the retired list (February 6); Flt. Lt. F. V. Beamish (R.A.F., retired) is reinstated on the active list as a Flight Lieutenant, with effect from January 27 and with seniority of March 23, 1932; Flt. Lt. A. N. Spottiswoode is transferred to the Reserve, Class A (February 4).

Equipment Branch

Flt. Lt. R. H. Latham is placed on the retired list on account of ill-health (January 27).

Medical Branch

F/O. D. S. MacL. Macarthur, M.B., Ch.B., is promoted to the rank of Flight Lieutenant (January 1).

Chaplains Branch

The Reverend H. Thomas, B.A., is promoted to the relative rank of Group Captain (February 2).

Memoranda

The permission granted to H. H. Wood to retain the rank of Lieutenant, which was withdrawn on his enlistment in the Territorial Army, is restored on his discharge (June 9); 207242 Flt. Cadet M. J. Flynn is granted an honorary commission as a Second Lieutenant with effect from April 2, 1919.

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers
General Duties Branch

The following are granted commissions as Flight Lieutenants in Class A on the dates stated:—H. W. A. Chesterman (February 2); W. R. Cox (February 9).

D. A. Davies is granted a commission as Pilot Officer in Class BB (January 26); F/O. C. B. Dove is transferred from Class A to Class C (April 1, 1936) (substituted for notification in the *Gazette* of July 7, 1936); F/O. R. D. Crofton is transferred from Class C to Class AA (ii) (June 30, 1936); Flt. Lt. R. C. Bryant is transferred from Class C to Class B (December 21, 1936).

The following Flying Officers relinquish their commissions on appointment to permanent commissions in the Royal Air Force (February 1):—G. P. Harger, A. T. Irvine.

Flt. Lt. G. W. H. Wailcousins relinquishes his commission on completion of service (August 3, 1936); F/O. L. E. A. Wright relinquishes his commission on completion of service December 30, 1936).

The notifications appearing in the *Gazette* of the dates stated concerning the undermentioned Flying Officers are cancelled:—T. W. Ashton (March 10, 1936); J. W. Brown (March 24, 1936); C. M. Willy (June 2, 1936); W. L. McLaren (June 30, 1936).

SPECIAL RESERVE

General Duties Branch

S. J. Harrison is granted a commission as Pilot Officer on probation (January 1).

AUXILIARY AIR FORCE

General Duties Branch

No. 504 (COUNTY OF NOTTINGHAM) (BOMBER) SQUADRON.—P/O. J. B. Parnall is promoted to the rank of Flying Officer (January 11).

No. 605 (COUNTY OF WARWICK) (BOMBER) SQUADRON.—The following Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—C. B. Thompson (December 19, 1936); H. M. Mitchell (January 26).

No. 607 (COUNTY OF DURHAM) (BOMBER) SQUADRON.—H. P. Dixon is granted a commission as Pilot Officer (December 20, 1936).

No. 608 (NORTH RIDING) (BOMBER) SQUADRON.—F/O. K. Pyman is promoted to the rank of Flight Lieutenant (December 1, 1936).

Equipment Branch

The following are granted commissions as Flight Lieutenants on the dates stated:—Capt. J. A. Crouch, Royal Artillery (Retired), F/O. T. L. Grey, R.A.F. (Retired) (December 16, 1936); Major E. A. Palmer, M.C., Royal Artillery (Retired) (December 29, 1936).

Accountant Branch

No. 504 (COUNTY OF NOTTINGHAM) (BOMBER) SQUADRON.—W. L. Dunn is granted a commission as Pilot Officer (January 11).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Air Commodore.—A. C. Maund, C.B.E., D.S.O., to Headquarters, Fighter Command, Stanmore; for duty as Air Officer in Charge of Administration, 28.1.37.

Group Captains.—H. G. Smart, O.B.E., D.F.C., A.F.C., to Aeroplane and Armament Experimental Establishment, Martlesham Heath; to command, vice Air Comdre. A. C. Maund, C.B.E., D.S.O., 28.1.37. H. J. F. Hunter, M.C., to R.A.F. Station, Finningley; to command, vice Group Capt. A. N. Gallehawk, A.F.C., 1.2.37.

Wing Commanders.—W. B. Hargrave, O.B.E., to Directorate of Personal Services, Air Ministry, vice Sqn. Ldr. G. R. Oliver, 31.1.37. T. V. Lister, to No. 5 Armament Training Camp, Penrhos; to command, 1.2.37. W. K. Mercer, to R.A.F. Station, Turnhouse; to command, 1.2.37.

Squadron Leaders.—E. D. H. Davies, to Headquarters, Training Command, Market Drayton; for Air Staff duties, 30.1.37. W. C. P. Bullock, to H.M.S. *Eagle*; for Armament duties, 1.2.37. J. G. Franks, to No. 5 Armament Training Camp, Penrhos, 1.2.37. L. G. Nixon, to Headquarters, Armament Group, Eastchurch; for duty as Senior Personnel Staff Officer vice Wing Cdr. T. S. Ivens, 1.2.37.

Flight Lieutenants.—J. Warburton, to School of Army Co-operation, Old Sarum, 1.2.37. P. C. Fair, to No. 1 Flying Training Camp, Leuchars, 1.2.37. C. J. Giles, to No. 5 Armament Training Camp, Penrhos, 1.2.37. A. N. Spottiswoode, to R.A.F. Station, Gosport, 1.2.37.

Acting Pilot Officers.—The undermentioned are posted to No. 8 Flying Training School, Montrose, with effect from 16.1.37:—R. F. D. Anstead, J. G. Cave, C. W. Beeton, H. H. Burnell, I. K. P. Cross, P. C. D. Eaton, E. T. Fairbank, B. V. Fanshawe, A. M. Gofton, D. T. Johnston, A. V. Hunter, J. M. Merry, N. E. W. Pepper, K. Petrie, W. T. Russell, R. J. Sage, F. W. Snell, W. R. Williams, B. H. M. Winslett, and L. C. Withall.

Equipment Branch

Wing Commander.—T. Fawdry, O.B.E., to No. 1 Equipment Depot, Kidbrooke; for Equipment duties, 1.2.37.

Squadron Leaders.—W. A. O. Honey, to Headquarters, Training Command, Market Drayton; for Equipment Staff duties, 1.2.37. R. D. G. Macrostie, M.B.E., to R.A.F. Station, Manston; for Equipment duties, 30.1.37. H. J. Payne, to Headquarters, Bomber Command, Uxbridge; for Equipment Staff duties, 28.1.37. W. J. Cleasby, to Headquarters, Fighter Command, Stanmore; for Equipment staff duties, 28.1.37. J. J. Ironmonger, M.B.E., to Directorate of Equipment, Air Ministry, vice Sqn. Ldr. R. D. G. Macrostie, M.B.E., 30.1.37. J. E. Truss, M.C., to Headquarters, Coastal Command, Lee-on-the-Solent; for Equipment Staff duties, 1.2.37.

Flight Lieutenants.—S. R. L. Poole, to No. 2 Mechanical Transport Storage Unit, Whyteleafe, 28.1.37. R. M. Thomas, to R.A.F. Station, Boscombe Down, 4.2.37. O. G. Ridley, M.C., to R.A.F. Station, Donibristle, 29.1.37.

Flying Officer.—A. E. Harbot, M.B.E., to R.A.F. Station, Carlington, 1.2.37.

Accountant Branch

Flight Lieutenant.—R. D. Pratt, to R.A.F. Station, Upwood, 27.1.37. R. Trippett, to R.A.F. Station, Usworth, 2.2.37.

Commissioned Engineer Officers

Flying Officer.—F. C. Whenman, to The Packing Depot, Seaford, 1.2.37.

Medical Branch

Group Captain.—H. A. Hewat, to Headquarters, Bomber Command, Uxbridge; for duty as Deputy Principal Medical Officer, vice Group Capt. T. Montgomery, 1.2.37.

Flight Lieutenants.—P. J. McNally, to R.A.F. Hospital, Cranwell, 1.2.37. J. F. Dales, to Central Medical Establishment, London, 1.2.37.

Flying Officer.—G. B. MacGibbon, to R.A.F. Station, Scampton, 5.2.37.

Chaplains Branch

Revd. P. J. O'Connell, to Headquarters, R.A.F., Iraq, Hinaidi, 30.1.37.

ANOTHER RECRUIT

The Dart Kitten in the Air : A Sturdy Low-wing Single-seater with Good Flying Qualities

It seems that there will always be a firm, if comparatively small, market for single-seaters which are inexpensive to run and to maintain. At the moment only one of the many available examples has been flown and developed for a sufficient length of time to satisfy the doubts in the minds of prospective owners—and this type, though filling only one section of the market, is now being sold in small but satisfactory numbers. The other half of the prospective market remains to be fully explored, and three or four more sporting types are either available, or will shortly be so. When one or more of these has shown its ability to stand up to continuous hard flying then its manufacturers can expect a small-scale demand.

The successful candidate will need to be amply strong, easy to fly, cheap to maintain, reliable, and fast enough to be used for serious cross-country work in reasonable weather conditions. The new Dart Kitten appears to comply with all but one of these conditions, and that remaining one could be filled by installing a more powerful engine.

At present the Kitten is fitted with a 27 h.p. Ava flat-four two-stroke, giving the machine an official cruising speed of 65 m.p.h. and and official climb of 400 ft./min. While I was flying the machine the speed at 2,300 r.p.m. did not appear to be very much higher than 60 m.p.h., and the full-throttle climb at the recommended speed was certainly not as good as 400 ft./min., so it can be supposed either that the Ava was not giving of its best, or that I was not getting the best out of the Ava. Another 10 h.p. would make all the difference to a machine which is certainly a very pleasant one.

As far as flying qualities are concerned the Kitten may, perhaps, be compared with one of the earlier Klemms, though the aileron control is much lighter and more pungent. The controls are, in fact, extremely nice, even though, in common with those of other ultra-lights, they are not particularly well harmonised. Probably it would be worse if they were, since the methods used for flying a machine with a wing-loading as low as 5.3 lb./sq. ft. are not at all normal.

When I tried the machine no spinning tests had been made, so my stalling experiments were carried out somewhat gingerly. At something a good deal less than an indicated 40 m.p.h. the Kitten started to sink on an even keel with ample control in all axes. A better test of its safe stall was given, quite unconsciously, by another pilot who had had little previous experience of such machines. He took it off successfully with the tail skid almost on the grass and with the machine thoroughly and adequately stalled; he brought it in much too slowly and held off too high, yet the machine just sank firmly on to the earth without dropping a wing. The aerofoil section, incidentally, changes from the root to the tapered tip, with a distinct "gull" effect, and this probably accounts for its good natural stability at the stall.

Roominess

Structurally, the machine is otherwise quite straightforward and does not give one the impression of being of small size; there is, in fact, lots of elbow room in the cockpit—a feature which cannot be overstressed. The undercarriage is of simple cantilever design, sprung by means of rubber discs.

Once a pilot has accustomed himself to the carburation, the Ava engine is very pleasant and exceptionally smooth-running in the air. On the ground there is an idling vibration inseparable from such a design and the movement of the protruding cylinders is startling to behold. However, it is better that the engine should leap about on its Silentbloc mountings than that it should try to break the machine. From the ground observer's point of view, it is, however, too noisy.

With the tail held a little below horizontal the Kitten flies itself off after one or two minor bounces, and, at the end of a trip, will land itself with almost equal facility, though the newcomer must be careful not to over-do the checking process. Naturally enough with such a relatively clean machine, the hold-off is somewhat prolonged, but all is well so long as the aforementioned newcomer does not treat his elevator violently. I found that, after an initial levelling-off, the stick could be held almost stationary until the final stall.

Given a rather more powerful engine the Dart Kitten will be a worthy candidate for the single-seater market. H. A. T.

THE DART KITTEN

27 h.p. Ava flat-four engine

Span	31 ft. 9 in.
Length	21 ft. 4 in.
Height	7 ft. 11 in.
Weight empty	440 lb.
Disposable load	242 lb.
Wing loading	5.3 lb./sq. ft.
Power loading	25.4 lb./h.p.
Maximum speed	75–80 m.p.h.
Cruising speed	65 m.p.h.
Stalling speed	37 m.p.h.
Endurance at cruising speed	4 hours.
Price	£345

Makers: Dart Aircraft, Ltd., 29, High Street North, Dunstable, Beds.

This *Flight* photograph of the Kitten gives a good idea of its comparatively large size. In the flying picture above, the "gull" effect may just be discerned.

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —

THE WEEK AT CROYDON

Rapid Replacement : Education : Humidity and Otherwise : Aerial Crèches : Reorganisation for Comfort

SURPRISE has been registered in some quarters that an engine, on the Douglas D.C.2 which recently landed at Eastchurch, could be changed in a few hours. Probably the owners of the aeroplane even felt slightly ashamed of the time taken, for at Swissair and K.L.M. headquarters the proper tackle enables the whole operation to be performed in about an hour without any feverish hustle. I'm told that a Douglas motor has been changed in twenty-five minutes over in the States! Why not? After all, an aero engine in these days should go in almost like an electric light bulb.

According to local gossip, an arrangement has been reached whereby Squadron Leaders may travel to Paris and back by Imperial Airways with that rare and cherished document—a cockpit pass. There is a lot to be learned from a body of men who must fly if weather permits—and whom most weather actually does permit. Old hands on the air routes develop instincts about weather conditions and their forecasts are quite as well worth listening to as those from an official source. Then, again, they have a surprising way of knowing exactly where they are, even though flying above or in clouds. All this may sound very "wizard" until you realise, for example, that Capt. Rogers, of Imperial's, has just completed 11,000 solid flying hours, and that some of the other seniors run him fairly close. Except for a hundred hours or so his flying has all been done on cross-Channel routes, for even during his military service he was a ferry pilot.

Gatwick is still, they say, a trifle humid, but I don't altogether believe the story of the man with the wheelbarrow—an agriculturist, no doubt—who, while taking the chance to do a spot of water-lily planting, suddenly sank, and was only retrieved with difficulty. If his wheelbarrow remained below full fathom five, the correct course would have been to moor a buoy over it, topped by an obstruction flag.

Striking Oil?

At Croydon there would appear to be a drought, for people have dug some four enormously deep wells and erected pumps. They are having no end of fun lowering buckets on ropes or swarming up and down ladders, and one party has built a tasteful rockery round the well mouth. I remember that some foreign professor of "dowsing" once flew in here with a divining rod and reported mineral oils somewhere under Purley Way or thereabouts. Perhaps these are oil wells, though, from the stuff they are pumping up, I should suspect them of being ink-wells. Some people say they are "sumps" which have got bunged up, but that's not so romantic.

One day last week a new phase in air-line activity was inaugurated—the Aerial Crèche, into which you just drop little Willy or Audrey and wander off to enjoy yourself. A Mr. Calvetti arrived at the airport with a year-old child, handed it to the stewardess of the K.L.M. 10.0 a.m. machine, and remarked that the child's grandparents would meet the machine the other end. The advantage of a lady attendant is abundantly clear in such cases.

February 13 was, despite the date, a fairly good day for air services, but Monday, February 15, was not so good—apart from the fact that Mondays never are, anyway. The majority of places on the Continent shut down with a bang early on, and Air France, British Airways, and two K.L.M. machines had to return to Croydon. Several of these flew for an hour or so before returning, and one of the two Dutchmen was over Holland before he gave it up. The point is that machines usually have enough fuel for the return journey, and I wonder if the public is sufficiently grateful for this sacrifice of possible revenue. Swissair had no difficulty, the weather in Switzerland being good.

Several Imperial Airways traffic clerks have silently stolen away, and it transpires that they have been selected for a course of instruction for appointments as ships' clerks on board the Empire flying boats. By the way, the airport lost-property office now lacks that row of solar topees, African idols, empty "square-face" bottles, souvenir slabs of Pyramid, and the rest of the flotsam and jetsam of Empire travel which brought a ray of sunshine and romance. I suppose a similar museum will have come into being at Southampton.

The Practical Angle

People here are looking forward with curiosity to the R.I.B.A. airport exhibition to be opened to-morrow. Airport people, especially those who do the practical, everyday work—handling passengers and freight, despatching aeroplanes with punctuality, working with H.M. Customs, and so forth, as well as those responsible for housing aeroplanes, organising workshops and stores—have pretty definite ideas on all these subjects. I wonder how many of the architects concerned will have studied these points from a practical viewpoint. I believe the time is ripe, anyway, for a covered "station platform," where aeroplanes, either on slow-moving platforms or tractor-towed, arrive and depart in a more civilised way than at present, when passengers have to embark and disembark in torrents of rain and sleet and battered by gales, both natural and artificial. Pilots do not need to try out all their motors on the actual tarmac, and if "tugs" were employed they could move majestically to some other spot before doing so. People would then, incidentally, never be blown violently backwards through the main doorway, down a corridor with several right-angled turns, via a couple of pairs of swing-doors, and into the Main Hall.

[Gatwick has attacked the airscrew-gale problem with its covered gangways emerging from the building.—ED.]

Another obvious necessity is the provision of electrically propelled luggage trucks instead of the present motley collection, some of which have wheels which scream like trapped rats or like young women in the swingboats.

A. VIATOR.

November It Is

ACCORDING to messages from Washington, Pan-American Airways will be ready by next November to collaborate with the Imperial Airways combine company in a regular North Atlantic mail service. The American Post Office has asked for £240,000 to subsidise the service during the year, but this has now been reduced to £180,000 since the full twice-weekly service could not be expected to start at once. P.A.A. will probably use the new Boeing boat.

Radio Changes at Croydon

ON and after March 1 the radiotelephony frequency (363 kc/s.) will be used during congested periods for two-way radiotelegraphy. Operators will, of course, be asked to change over to this frequency when necessary by the Croydon control officer.

After February 21 the Croydon radio station will transmit the current weather report at quarter-hourly intervals on 336 kc/s. (993 m.) by W/T. The idea, of course, is to eliminate the necessity for individual requests and answers.

Minor changes have also been made in the R/T weather broadcasts from Borough Hill. These changes are detailed in *Notice to Airmen, No.* 15.

Getting There First

SINCE a supposedly ghoulish public demands to see close-up pictures of fires, floods and pestilences in the morning paper, it is up to the photographers to get them—from the air for preference. Brian Allen, of Croydon, has put the whole essence of his photographic service on one small postcard depicting a Cessna from which a photographer is "shooting," a burning building. The conflagration is, or was, a very real one and the photograph is taken from 200ft. or so. You can even see the lines of hose and the firemen. The caption—"We catch 'em while the flames are burning"—tells the rest of the story.

Towing Without Tears

IN co-operation with Air Publicity, Airwork have designed a new system for towing aerial posters of the type employed by that firm, in which the letters are flown vertically on a framework. These banners are at present towed by small machines which leave the ground with the banner fully extended.

Using this method, however, it is impossible to haul in or exchange the banner in flight, and the machine must proceed to its advertising area at the slow speed imposed by the drag of the poster. According to the new method, which is at present only applicable to large machines, the banners will be interchangeable in flight and need not be extended until the area of operations is reached. The banner will be wound on a spool mounted in a vertical position in the cabin. The frame supporting this spool can be lowered through an opening in the floor and the banner then unwound by the slipstream, regulated by a clutch mechanism. The spool-carrying framework is lowered and retracted by a hand winch, and it is at present intended to rewind the banner on to the spool by hand, although a small electric motor may be incorporated later.

The "Cloud of Iona" Accident

FOLLOWING his investigation of the loss of the *Cloud of Iona* on July 31, 1936, the Inspector of Accidents concluded that: (a) The machine was forced to descend into the sea by reason of a sudden and probably complete loss of engine-power which occurred when within sight of Jersey: (b) It is not possible, on the available evidence, to arrive at any definite opinion as to the cause of this loss of power; and (c) The pilot successfully brought the amphibian aircraft on to the water, but it was subsequently swamped by the heavy seas prevailing at the time.

Guernsey Airways, Ltd., owners of the amphibian concerned, were last week fined £300 in the Guernsey Police Court for operating the machine on three dates (including that of the disaster) without radio—in contravention of the Air Navigation Regulations.

After two adjournments, Mr. D. M. Brown, A.I.D. inspector at Portsmouth at the time of the disaster, gave evidence at the final hearing. He denied that he had examined the machine with a view to passing it as complying with the necessary regulations. He had merely inspected it with the idea of recommending the Air Ministry to extend its C. of A. period for one month, since this certificate was due to expire. Mr. Peter Lee, Guernsey Airways' ground engineer, stated that Mr. Brown had pointed out to him that if the machine was to carry ten or more occupants wireless equipment would have to be fitted.

This conclusive evidence terminated the hearing, the magistrate saying that the facts of the case were not disputed. The defendants' only excuse—and this a poor one—was that they had been confused in the number of passengers which they were allowed to carry without radio. He considered that this neglect of the current regulations almost amounted to wilful negligence.

Through to Hong Kong

IT is now expected that Pan-American Airways' Pacific service will be flying through to Hong Kong before the end of March. At present the service terminates at Manila, though at least one experimental flight has been made between this point and the China coast.

"Castor" Makes It Up

AFTER her two-day delay at Southampton and a further delay due to weather on the way, the Short boat *Castor*, which is inaugurating the regular all-air services to Australia, flew from Marseilles to Alexandria on Tuesday of last week. The 1,800-mile journey was covered in an overall time of 12 hours 55 minutes. On the first day, as recorded in last week's issue, there was fog in the Rhone Valley, and *Castor* made for Bordeaux on her way to Marseilles.

The Air Registration Board

SIR MAURICE DENNY has been appointed chairman of the new Air Registration Board for the ensuing year.

Sir Maurice is chairman of Wm. Denny and Bros., the Dumbarton shipbuilders, and is a director of several other concerns, including the Blackburn Aircraft Co. He was chairman of the British Corporation Aviation Committee which was set up in 1927 and has since been joint chairman, with Mr. A. L. Sturge, of the Joint Committee of Lloyd's Register and the British Corporation, which was previously responsible for much of the work now to be taken over by the A.R.B.

Chinese Connections

REGULAR services connecting Hong Kong with the Chinese air route system are now scheduled. China National Airways early in November started to include Hong Kong on their Shanghai-Canton service, thereby connecting with Imperial Airways' Penang service.

The Hewi Tung Co., a Sino-Japanese aviation enterprise in North China, started operations in November last with mail and passenger services between Tientsin and Dairen and between Tientsin and Chinchow. Other lines are to be operated when sufficient equipment has been acquired. The new company now has eight machines in operation.

Air France and the Atlantic

YET another scheme for an inland flying boat base to be used for Air France's projected North Atlantic service has been receiving consideration at the French Air Ministry. The idea is to create an artificial lake at Muret, near Toulouse, and to make this the French terminus of the line.

M. Vincent Auriol, who, in addition to being finance minister in M. Blum's Ministry, is mayor of Muret, has been holding conferences there, with Air Ministry officials in attendance, to discuss the building of a dam from Puinsaguel to Muret. This would make it possible for a lake, three by two kilometres in size, to be artificially created by diverting the waters of the Garonne. If, however, the inland flying-boat base idea is to become a reality, it is regarded as far more probable that the point selected will be nearer Paris, such, for instance, as the one proposed on the banks of the Seine at Gennevilliers, just north of Paris, and not far from Le Bourget.

ACCURATE MEASUREMENT of fuel and oil as supplied through pumps and cabinets is an important factor in economical aircraft operation, particularly in the case of large fleets. Many oil-dispensing cabinets are now fitted with the "Victory" meter—one model of which is illustrated above—made by Precision Meters, Ltd., 104, High Holborn, London, W.C.1. Very accurate measuring and recording, even after prolonged service, is the chief claim for this instrument, which has recently passed N.P.L. tests of these qualities.

AIR-MAIL COMMENTARY

AIR HISTORY on STAMPS

By ALEC DAVIS

A PICTORIAL history of aviation is provided by the illustrations on air stamps issued within the last few months.

Perhaps of greatest interest among these is a set from Peru, which begins with the portrait of a real pioneer wearing his cap in the approved back-to-front fashion of pre-war aviators.

He is Jorge Chavez, a wealthy young Peruvian who lived in France, was amateur running champion of that country from 1905 to 1907, and became the first Peruvian pilot. He bought two monoplanes—a Henri Farman and a Gnome-engined Blériot—and established several records.

The three Peruvian issues referred to by the author. The first shows Peruvia's first pilot, Jorge Chavez; the second a Douglas D.C. 2; and the third a Ford Trimotor.

In the Blériot he attempted to make the first flight across the Alps, a feat for which a competition had been organised. He succeeded tragically. Starting from Brigue, in Switzerland, on September 22, 1910, he managed to fly over the Simplon Pass to Domodossola, on the Italian side, but in landing there his machine overturned, both his legs were broken, and he died soon afterwards, aged twenty-three.

In addition to the stamp now issued bearing Chavez' portrait, another in the same set gives an air view of the present-day military aerodrome and training school at Las Palmas, which is named "Jorge Chavez" in his memory.

From pre-war years our history jumps to a famous war-time aeroplane. Nicaragua adds to the new issues stamps surcharged with new values, using an earlier design that depicts two military biplanes over the Momotombo volcano, which is smoking gently like a wind-indicator. Soon after the Great War, Nicaragua acquired a few American-built D.H.4s with Liberty motors, and it appears that two of these were chosen for illustration on the stamps when they were first issued in 1929.

Then, among commercial types of ten or more years ago, a Dornier Wal flying boat moored on the lake of Amititlans is shown on one of Guatemala's latest. Incidentally, two others in the same set illustrate the airport of La Aurora. One, for use on foreign mails, shows the hangars with a biplane and five monoplanes lined up in front, but the other, for internal mails, shows the same hangars almost hidden behind a crowd of people. Presumably they are air-minded Guatemalans, for the airport is close to the capital city. It is used for mail services by the Cia. Nacional de Aviacion, which has been in existence for some seven years now.

The Ford Trimotor

A later type than the Dornier—a landplane of almost equal popularity—appears on the 70 c. value in the Peruvian series already referred to. It is a Ford Trimotor, seen over one of Peru's coastal towns. The Pan-American Airways group still operates this type on its services from Peru to the States and to Uruguay, and even the P.A.A. badge that decorates the side of the fuselage can be recognised on the stamp.

A more modern air liner used on the same routes is the Douglas D.C.2, which is illustrated on a high-value stamp in the same set—the 2 soles. Shown in flight at a height of not more than seventy or eighty feet with the undercart completely retracted, it presumably illustrat modern take-off technique.

Still more modern is the Martin flying-boat, *China Clipper*—another P.A.A. type, though it happens to be illustrated on a stamp from Roumania, which shows it so indistinctly that the shadow is more distinct than the real thing. Apparently this stamp is a "charity" issue, the main purpose of which is to raise money for the *Fondul Aviatiei*.

(Above) The *China Clipper* on a Rumanian stamp. (Right) Nicaragua shows D.H.4s.

Scientific Soundproofing

THAT the reactions of a person placed in noisy surroundings are retarded by as much as 25 per cent. has, it is stated, been proved in tests recently carried out by the firm of Soundproofing, Ltd., Minerva Road, Park Royal, London, N.W.10, which was recently formed to undertake the scientific soundproofing of aircraft. Investigating the problem from this angle, they are of the opinion that the fatigue caused to personnel on long flights by noise constitutes a most serious strain on efficiency—a view with which few will disagree. It should also be borne in mind that this strain is often suffered without the individual being aware of its real cause.

Soundproofing, Ltd., feel that the value of scientific soundproofing of cockpits and wireless cabins in military aircraft is worthy of serious consideration. Further, they maintain that effective distribution of soundproofing weight can only be achieved through instrument analysis of the noise production in the individual aircraft. The precision instruments they use are the Noise Meter, Frequency Analyser and Recording Cathode-Ray Oscillograph. With these they are able to analyse frequencies, volume and the exact source of extraneous noise in all types of aircraft. Their knowledge of the application of soundproofing materials then enables them to introduce effective measures without unnecessary weight increases.

Their methods, broadly speaking, fall under four heads: (1) Vibration isolation—such as flexible engine mountings, etc.; (2) noise insulation—incorporated in construction; (3) noise absorption—treatment of interior in order to reduce the reflected sound to a minimum; (4) resonance damping—to reduce beat amplifications of sound at resonant surfaces.

The technical manager is Mr. R. S. Rae, who has had experience of soundproofing both in England and abroad.

Tecalemit Appointments

PROMOTIONS to the Tecalemit board of directors were announced by the recent confirmation of the respective appointments of Mr. W. J. Parslow (general manager) and Mr. A. Sewell (sales manager). Mr. Sewell formerly held a commission with the R.F.C. and R.A.F.

Lorraine Engine Developments

REGISTERED as a private company on February 12, with a nominal capital of £70,000 in 280,000 ordinary shares of 1s., was the firm of Aero-Marine Engines, Ltd. The first directors are not named in the registration particulars.

Flight understands that one of the objects of the new concern is the manufacture in this country of Lorraine engines.